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BARTONIA

Journal of the Philadelphia Botanical Club

Since its founding in 1891, the Philadelphia Botanical Club has offered outstanding programs, field trips, and other opportunities for those with an interest in plants to meet and exchange information. Monthly meetings (www.philbotclub.org/meeting.html) feature speakers from various botanical backgrounds. They are held at 7:30 p.m. on the fourth Thursday of the month in September, October, and January through May and the third Thursday in November and December, usually at the Marvin Comisky Conference Center, One Logan Square (one block east of the Academy of Natural Sciences of Drexel University). From April to October, expert field botanists lead field trips in the mid-Atlantic region and occasionally elsewhere in North America or overseas (www.philbotclub.org/field_trips.html).

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Bartonia, in publication since 1909, was named for William P. C. Barton (1786-1856), Professor of Botany at the University of Pennsylvania and author of the first local flora (1818), *Compendium Florae Philadelphicae* (and nephew of physician and botanist Benjamin Smith Barton, who was a mentor of the explorer Meriwether Lewis). The journal began as an annual abstract of the Club's proceedings with short articles on the plants of the Philadelphia area. Its scope has broadened to encompass original research in plant systematics, plant ecology, and plant conservation biology with articles on floristics, distribution, methods, biography, bibliography, history of botanical exploration, and other topics of botanical interest ranging throughout—and well beyond—the mid-Atlantic region.

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Additions and Corrections to the Checklist of Vascular Plants of Cumberland County, New Jersey

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ABSTRACT. Recent field, herbarium and literature research has resulted in 302 changes (202 additions, 11 deletions, 67 alterations to abundance or nativity status, 22 name changes) to the checklist of vascular plants of Cumberland County published in 1989 (Bartonia 55: 25-39). For the additions, 116 represent non-native species and 82 are native species (4 other additions are hybrids). The total number of species reported from the county is 1531, 1094 of which are native and 437 are non-native. A summary is provided for rare taxa in the county with 205 being reported, of which 34 are new to the county (i.e., not on the 1989 list); 23 species previously reported as historical are now known to be extant. A summary is also provided for invasive species in the county, with 93 species being reported as invasive or potentially invasive in New Jersey (Category 1 or Category 2), Delaware, New York or Pennsylvania, with 33 of these being new to the county.

INTRODUCTION

Moore (1989) reported the occurrence of 1340 species (37 pteridophytes, 10 gymnosperms, 1293 angiosperms) from Cumberland County. In the 25 years since this publication, field work by the authors and other field researchers has resulted in the discovery of numerous species previously unreported from Cumberland County. Organized field trips by the Philadelphia Botanical Club and Torrey Botanical Society have also resulted in additional discoveries. Examination of material at herbaria, including the Academy of Natural Sciences of Drexel University (PH); Brooklyn Botanic Garden (BKL); Harvard University (A, GH, NEBC); Liberty Hyde Bailey Hortorium at Cornell University (BH); New York Botanical Garden (NY); Rutgers University-New Brunswick (Chrysler Herbarium; CHRB); and the National Museum of Natural History, Smithsonian Institution (US), has also led to additional discoveries and corrections. These new findings are reported here.

METHODS

New discoveries were primarily documented through the collection of voucher specimens. The “rule of thumb” (i.e., essentially do not collect whole plants unless there are more than



20 individuals in the population) collection protocols (Norton et al. 1994, Wagner 1995) were followed when vouchering native species. In those cases where a voucher was not collected, other documentation, such as a published or unpublished report, is cited. As in the original checklist (Moore 1989), species enclosed in brackets are not native to New Jersey.

For convenience' sake, the arrangement used in the 1989 checklist—families arranged alphabetically within Pteridophytes, Gymnosperms and Angiosperms—is followed here. Also for the sake of convenience, the family-level taxonomy (Kartesz and Kartesz 1980) used in the 1989 publication is used. While, this arrangement is admittedly out of date (see Angiosperm Phylogeny Group 2009 for a more recent family arrangement), the information presented here is meant to serve as a supplement to the original checklist and this is best done working within the original family sequence. Likewise, this report does not seek to update the generic concepts used in the original checklist, updated information being readily available in many recent publications (e.g., recently published volumes of *Flora of North America*). Therefore, for example, all of the *Aster* species reported in the original publication are not re-reported here with their accepted names in *Doellingeria*, *Eurybia*, *Ionactis*, *Oclemena* and *Symphiotrichum*.

Recent taxonomic revisions involving circumscriptional changes that resulted in a species previously not recognized now being recognized and known from the county are reported. For example, *Solidago stricta* and *S. tarda*, not reported in the original list as they were considered respective synonyms of *S. sempervirens* var. *mexicana* and *S. arguta* var. *arguta*, are reported here, since they are now generally held as distinct species (e.g., Semple and Cook 2006). Names used in the original list that were misapplied or are now formally rejected are also updated here.

Except for “historical”, the abundance determinations in the original checklist (historical, rare, occasional, frequent, common) are admittedly quite subjective, but, nonetheless, useful. Updates to these are given only when 1) a species of historical status was rediscovered; 2) a species with an extant status is now believed to be historical; or 3) when a status given was later determined to be significantly off, such as a species that was originally cited as rare but is now known to be frequent or common (a shift of two or more abundance categories).

Table 1 provides a list of 21 species and 1 hybrid that have been reported in the literature as occurring in Cumberland Co., but for which a specimen or other corroborating evidence is lacking. Rare taxa tracked by the New Jersey Natural Heritage Program (Snyder 2013) are indicated with an asterisk (*). Table 2 provides a list of all rare taxa from the original list and the additions made here. Species tracked as invasive or potentially invasive in New Jersey (Snyder 2009a, 2009b), Delaware (Delaware Invasive Species Council 2014), New York (New York Codes, Rules and Regulations Part 575.3(2)), or Pennsylvania (Pennsylvania Department of Conservation and Natural Resources 2014) are indicated by a dagger (†). Table 3 provides a list of all invasives from the original list and the additions made here.

Unless it is stated that the species was inadvertently left off of the original checklist, additions to the checklist in the Results below had no historical records at BKL, CHRB, NY or PH. Unless it is stated otherwise, cited voucher specimens (cited in parentheses with collector and collection no. given) are deposited at BKL. The identity sign (\equiv) is used to indicate homotypic synonyms; the equals sign (=) is used to indicate heterotypic synonyms.

RESULTS

PTERIDOPHYTES

Lycopodiaceae

001. Change status: *Lycopodium tristachyum* (\equiv *Diphasiastrum tristachyum*) from historical to rare. Observed in an oak-pine woodland at the Willow Oak Natural Area in Vineland (Moore 7507).

Schizaeaceae

002. Change status: *Schizaea pusilla** from historical to rare. Historically, this rare species was known from only two sites: the Sherman Avenue bog along the Parvins Branch of the Maurice River in Vineland near State Route 55 (Bayard Long s.n., 12 Aug. 1923, PH) and in the Ingersall Branch of the Manumuskin Creek in northeastern Maurice River Twp. (Bayard Long 39292, 5 Mar. 1933, PH). During a field trip of the Philadelphia Botanical Club and Torrey Botanical Society in 2010 (Moore and Brecht 2013) was rediscovered by Janet Novak at the Sherman Avenue bog site (Moore 9932).

GYMNOSPERMS

Pinaceae

Pinus subsect. *Australes*

In the county, five species of hard pine (*Pinus* L. subg. *Pinus*) are native, *P. echinata*, *P. rigida*, *P. serotina*, *P. taeda* and *P. virginiana*. All five are placed in *P.* sect. *Trifoliae*, with the first four being placed in *P.* subsect. *Australes* and the last being placed in *P.* subsect. *Contortae* (Gernandt et al. 2005). Hybrids and intermediate material involving the species in *P.* subsect. *Australes* can be observed in the county. These are discussed below.

003. Add *Pinus echinata* \times *P. rigida*, rare. Material that is clearly intermediate between these two species and presumably representative of this hybrid has been observed in sandy pine-oak uplands near the Manumuskin River (Moore 9345) and Manantico Creek (Moore 9822) in Maurice River Twp. and Millville. This hybrid has also been produced artificially (S. Little and Somes 1951, E. Little and Richter 1965) and has been reported to occur naturally elsewhere (Austin 1928, 1929; Smouse and Saylor 1973b).

004. Add *Pinus rigida* \times *P. taeda*, rare. There is a plantation of this hybrid in Belleplain State Forest along the border of Cape May and Cumberland County. In this area, material (Moore 9965) that appears to represent this hybrid has been found adjacent to the plantation in Maurice River Twp., the material apparently representing subsequent generations that have seeded in from the original plantation. Material that appears to represent this cross has also been found near Bear Swamp (Moore 3296, 3297, 3300) and Turkey Point (Moore 9145). This material likely represents natural crosses between native material of *P. rigida* (or possibly *P. serotina*) and *P. taeda* (Smouse 1971, 1972; Smouse and Saylor 1973a, 1973b). This hybrid is occasionally referred to as "*Pinus* \times *rigitaeda*", although this is an invalidly published nomen nudum (Hyun and Ahn 1959).

005. Change status of *Pinus serotina** from rare to undetermined. *P. serotina* was first reported from New Jersey from Gloucester and Salem Cos. by Long (1909), Long's identifications being confirmed by John K. Small and Roland Harper. Since then, southern New Jersey has always been cited as the northern limit of the range of *P. serotina* (e.g., Fernald 1950, Gleason and Cronquist 1991, Kral 1993). However, much of the "*P. serotina*" material in southern New Jersey, including the material in Cumberland Co. (e.g., Moore 3293, 3294, 3295, 3296, 3297, 3298), which is usually found in the southwestern part of the county, is intermediate between *P. rigida* and *P. serotina*. Smouse and Saylor (1973 a, b) reported southern New Jersey to have material representing good *P. rigida* and material that was transitional between *P. serotina* and *P. rigida*. Furthermore, Smouse and Saylor (1973 a, b) found transitional material in Delaware, Maryland and Virginia on the Delmarva Peninsula where the ranges of the two taxa also overlap, and they proposed the two taxa be recognized as subspecies within a single species, *P. rigida* Mill. subsp. *rigida* and *P. rigida* subsp. *serotina* (Michx.) R.T. Clausen. Molecular studies investigating the *P. rigida-serotina* complex are lacking.

Non-native pines

006, 007. Add [*Pinus resinosa*], rare. Add [*Pinus sylvestris*], rare.

Small stands of both species were observed at the top of Pine Mount in Greenwich Twp. (Moore 11658) during a Philadelphia Botanical Club trip in 2014. Material of each species represents escaped material or cultivated remnants. The material appears to be reproducing as saplings of both were noted. *Pinus resinosa* is native to North America in the eastern U.S. and Canada (Kral 1993). It is endangered in New Jersey (Snyder 2013), native populations being known only from northern New Jersey in Sussex Co. *P. sylvestris* is native to Asia and Europe (Gaussen et al. 1993). It is known to escape in the northern U.S. and Canada.

008. Add: [*Pinus thunbergii*], rare. Native to Japan (Ohwi 1965) and Korea (Fu et al. 1999), it has been planted along State Route 55 (Maurice River Twp., Millville, Vineland) and as part of restoration efforts in areas of previous sand or gravel mining in Maurice River Twp. and Commercial Twp. At some of these sites in Commercial Twp., Millville and Maurice River Twp., the species has been reproducing and appearing beyond the original plantings (Moore 5669); thus, it is best taken as being established outside of cultivation.

009. Add *Tsuga canadensis*, rare. Discovered by David Snyder at one site near the Manumuskin River N of Cumberland Pond in Maurice River Twp. Stone (1911: 150–151) described this species as a "straggler" in southern New Jersey, none of the six stations reported being from the Pinelands.

Taxaceae

010. Add [*Taxus* sp.], rare. Seedlings and saplings of *Taxus* material presumably originating from seeds dispersed from cultivated material have been observed in woodlands at Davis Mill (Moore 5669) and elsewhere. This material is not identifiable to species (see discussion in Hils 1993).

ANGIOSPERMS

Aceraceae

011. Add: [*Acer pseudoplatanus*]†, historical. A specimen (*Long* 47924, 27 Oct. 1935, PH), collected W of Carmel in Deerfield Twp., was overlooked when the original checklist was prepared. Native to western Asia and Europe (*Rehder* 1940, *Walters* 1968), extant populations of this species are not known for the county. In New York City parks, this species is invasive sometimes outcompeting *Acer platanoides*, another highly invasive maple species (*Ma and Moore* 2009).

Aizoaceae

012. Add: *Sesuvium maritimum**, rare. This rare species was observed from Thompsons Beach in Maurice River Twp. (*Moore* 2004a, 2015; *Moore* 5526, 5579, 11250) and Bivalve in Commercial Twp. in disturbed, open, wet, saline areas (*Moore* 2015; *Moore* 11247). These two populations are quite large (although the population at Thompsons Beach when first discovered in 2004 was small consisting of two patches) and occur in areas that have been botanized previously (prior to 2004) without observing the species, thus suggesting possible recent establishment. Historically, known only along the Atlantic Coast of New Jersey, *Britton* (1881: 37; 1889: 112) stating it to be frequent “on the coast from Sandy Hook to Cape May” and “on the sea-beaches” but *Stone* (1911: 435) noting it to be “occasional on the sea beaches; not nearly as abundant in New Jersey as most statements would lead one to suppose.”

Alismataceae

013. Add: *Sagittaria teres**, rare. This state-endangered species was discovered by Brett Roberts in a borrow pit in southeastern Maurice River Twp. near the border with Cape May Co. in 2005 (*Moore* 9972). It was later found in an intermittent pond in Maurice River Twp. southwest of Hunters Mill by the first author and John Bunnell and Kim Laidig of the New Jersey Pinelands Commission (*Moore* 10805).

Amaranthaceae

014. Add: [*Froelichia gracilis*], frequent. Native to the U.S. chiefly west of the Mississippi River (*Blake* 1956, *McCauley* 2003), this adventive is frequent in dry, sandy open areas throughout the county (*Douglas Goldman* 2260, BH; *Moore* 5486).

Anacardiaceae

015. Add: [*Rhus aromatica*], rare. Found in Millville in the Woodland Shores neighborhood near Union Lake. It occurred along the edge of a Virginia pine woods near the roadside (*Moore* 10602). While this species is reported as a native from a few northeastern states, it is generally taken as non-native for New Jersey (*Snyder* 1987).

Aquifoliaceae

016. Add: [*Ilex crenata*], rare. Native to Asia (*S.-K. Chen et al.* 2008), recently observed in a mesic oak woodland in Willow Oak Natural Area in Vineland (*Moore* 10652). As has been reported from New York (*Glenn and Moore* 2009a), the population observed in Cumberland Co. consisted of a few scattered individuals. *I. crenata* most closely resembles,

I. glabra from which it can be distinguished on the basis of its crenate leaf margins (leaves entire or toothed at apex in *I. glabra*) and 5-8-merous flowers (4-merous in *I. glabra*) (Rehder 1940).

Araceae

017. **Change status:** *Acorus calamus*† from native to non-native. Now generally taken as a non-native species in North America (Thompson 2000). All *Acorus* material from the county examined has been identified as this species and not the native *Acorus americanus*, a rare species in New Jersey (Snyder 2013).

Araliaceae

018. **Add:** [*Aralia elata*]†, **frequent**. Native to Asia (Xiang and Lowry 2007), this species occurs in disturbed deciduous forests, thickets and roadsides throughout the county (Moore 5598a, 6777, 6954), and can be rather invasive (Ma and Moore 2008). It can distinguished from *Aralia spinosa* on the basis of leaflet venation (veins straight, ending in the teeth in *A. elata*; curving before reaching margin in *A. spinosa*), central inflorescence axis (absent or very short, less than 12 cm. in *A. elata*; long, to 100 cm. in *A. spinosa*), fruit size (dried: 3.0–3.5 mm. × 3.0–3.5 mm. in *A. elata*; 4.0–5.0 mm. × 3.5–4.0 mm. in *A. spinosa*) and seed size (dried: 2.5–3.0 mm. × 1.5–2.0 mm. × 0.8 mm. in *A. elata*; 3.0–3.5 mm. × 1.5–2.0 mm. in *A. spinosa*) (Moore et al. 2009).

019. **Delete:** *Aralia spinosa*. See discussion in Table 1.

020. **Add:** [*Hedera helix*]†, **occasional**. Native to Europe (Webb 1968a) and commonly planted, occasionally encountered as a cultivated remnant or a true escape (Moore 10777).

Asclepiadaceae

021. **Add:** *Asclepias lanceolata**, **rare**. This rare species, which reaches the northern limit of its range in southern New Jersey (Gleason and Cronquist 1991), was reported from Cumberland Co. in the Maurice River watershed by Richard Radis (1992). Based on distributional information in Stone (1911) and Hough (1983), this may represent the only record for this plant along the Delaware Bay, all other records being along the coast strip in Atlantic, Burlington, Cape May and Ocean Counties.

022. **Change status:** *Asclepias variegata** from historical to rare. Since 1984, this rare species has been observed in Commercial Twp. near the Millville airport, Downe Twp. near Dividing Creek, and in Maurice River Twp. near Cumberland Furnace (Moore 1988) and Jones Mill. All of these populations were small (five or fewer plants). Historically, also known from Buckshutem in Commercial Twp., (Bayard Long s.n., 16 Jun. 1909, PH), Downe Twp. (Fairbrothers and Bernard 1962), Springtown in Greenwich Twp. (Bayard Long 40360, 4 Jun. 1933, PH), Hopewell Twp. (Bayard Long 40436, 11 Jun. 1933; 46574, 10 Jul. 1935, PH), Port Elizabeth in Maurice River Twp. (Bayard Long 43818, 24 Jun. 1934) and the Jericho area in Stow Creek Twp. (Bayard Long 37662, 12 Jun. 1932). Given the recent sightings and the number of historical records, it seems best to treat the species as an extant rare plant in the county.

Asteraceae

023. Add: [*Arctium lappus*], rare. Native to Europe (Perring 1976), recently collected in an open disturbed agricultural area in Stow Creek Twp. (Moore 10858).

024. Add: [*Arctium minus*], rare. Native to Europe (Perring 1976), recently collected twice in open disturbed agricultural areas in Hopewell Twp. (Moore 10972) and Stow Creek Twp. (Moore 10966).

025. Add: [*Artemisia annua*], occasional. Native to Europe (Tutin et al. 1976) and Asia (Lin et al. 2011), recently observed at a few sites in disturbed open areas along the bayshore (Moore 5132, 10666).

026. Add: [*Artemisia vulgaris*]†, frequent. Native to Europe (Tutin et al. 1976) and Asia (Lin et al. 2011), a frequent weed in open disturbed areas throughout the county (Moore 5482, 9998, 11225). It was not reported in Stone (1911) but was reported from southern New Jersey by Britton (1881, 1889).

027. Change status: *Aster infirmus** (≡*Doellingeria infirma*) from occasional to historical. Historically this rare species was known from near Garton in Deerfield Twp. (Bayard Long 44248, 21 Aug. 1934; 47209, 8 August 1935, PH) and Fairton (Bayard Long 44913, 44922, 7 Oct. 1932, PH) and Gouldtown (Bayard Long 34913, 34938, 12 Oct. 1930; 46552, 10 Jul. 1935, PH) in Fairfield Twp. See Snyder (2000) for discussion on the decline of this species in New Jersey on the Coastal Plain.

028. Add: *Bidens mitis**, rare. One population of this state-endangered species was discovered near Lores Mill in Commercial Twp. (Moore 7665). The species is distinguished from other *Bidens* species on the basis of its compound leaves, ray flowers over 1 cm. and small achenes (2.5–5.0 mm.) with margins that are lacking or largely lacking cilia.

029, 030. Change name and status: *Boltonia asteroides* var. *asteroides*, historical to *Boltonia asteroides* var. *glastifolia**, rare. The variety was wrongly identified in the original checklist. Historically this state-endangered taxon was reported from one location in Vineland along Mays Landing Rd. (Bayard Long 47570, 1935, PH). Another site was located by Stephen Field further north in Vineland in the 1990s in a wet, open area, along a power line right-of-way.

031. Add *Erigeron philadelphicus*, frequent. This species—now frequent in southern New Jersey—was largely absent from the region, not being mentioned by Stone (1911) and not reported from the Coastal Plain of New Jersey by Britton (1881, 1889), Keller and Brown (1905) or Taylor (1915). There is one specimen from southern New Jersey at PH from the late 1800s (Burlington Co.: s.l., s.n., 27 May 1891, Bordentown). All other specimens (very few) were collected after 1912, including one from Cumberland Co. (M.H. Williams s.n., 27 May 1923, Delmont), this specimen being the basis for the species inclusion in Briggs (1930). This is a striking case of a native plant spreading into a large area (southern New Jersey) in recent times (see discussion in Moore, in review). Currently, in the county, it is frequently encountered in moist open areas, especially roadsides (Moore 11637).

032. Add: *Eupatorium capillifolium, rare.** This state-endangered species was first reported from the county by Ted Gordon (1990) based on material observed on a Philadelphia Botanical Club field trip (Moore 1990) near the West Creek Baptist Cemetery. Since this discovery, the species has been found at other locations W of Port Norris in Commercial Twp. (Moore 10224), Lores Mill in Commercial Twp. (Moore 10230) and Hoffmans Mill in Maurice River Twp. (Moore 7660).

033. Change status: *Eupatorium coelestinum (\equiv *Conoclinium coelestinum*) from historical to rare.** A small population of this rare species was discovered in Millville in a disturbed, weedy, open, moist area adjacent to the Maurice River below the Union Lake Dam (Moore 9901). This species is occasionally grown and it was not clear if this material represented material escaped from cultivation.

034. Add [*Gaillardia pulchella*], rare. Native to the central and southeastern U.S. (Strother 2006), observed in upland roadsides in Haleyville in Commercial Twp. and near Davis Mill in Stow Creek Twp. (Moore 11354).

035. Change status: [*Galinsoga parviflora*] from historical to frequent. Recently collected in vacant lots in Millville (Moore 10887, 10894) and observed elsewhere; one historical collection at PH (B. Long 64877, 18 Jul. 1946, 1 mi. SE of Coopers Mill). Material is referable to *Galinsoga parviflora* var. *parviflora*, which is native to Central and South America (Canne-Hilliker 2006).

036. Change status: [*Galinsoga quadriradiata*]: from rare to frequent. Like the preceding, it is native to Central and South America (Canne-Hilliker 2006). Both *Galinsogas* (*G. quadriradiata*: Moore 10899, 10902) are most frequently encountered as weeds in vacant lots and waste grounds in urban areas, a point noted by Britton (1881, 1889) for *Galinsoga parviflora*. The two species are superficially similar and some specimens originally determined to be *Galinsoga parviflora*, the only species reported in early floristic works (e.g., Britton 1881, 1889; Stone 1911), have proven to be this species. One historical collection examined at PH (B. Long 47577, 22 Sep. 1935, WNW of Fairton).

037. Add *Helianthus* \times *laetiflorus*, rare. Rarely encountered in the western part of the county along upland roadsides and other open areas. Material at PH: A. Beals and G. Bassett s.n., 1 Sep. 1924, Seeley's Mill (Cedar Grove), 4 mi. NW of Bridgeton; B. Long 44392, 29 Aug. 1934, S. of Carmel; B. Long 44547b, 16 Sep. 1934, SE of Bridgeton. Possibly introduced and believed to represent hybrids (including backcrosses) between *H. pauciflorus* and *H. tuberosus* (Schilling 2006). The native status of the purported parents in the eastern U.S. is also unclear (Schilling 2006).

038. Add: [*Hieracium flagellare*], occasional. Native to Europe (Sell and West 1976) and possibly originating from hybridization between *H. caespitosum* and *H. pilosella* (Cronquist 1980), this species has been noted at a few disturbed, sandy roadside sites in Maurice River Twp. (Moore 7234).

039. Add *Pluchea camphorata, historical.** This species was reported by the New Jersey Natural Heritage Program (2014) in a list of rare species reported for the county. The species is tracked as extirpated by the New Jersey Natural Heritage Program (Snyder 2013).

040. Change status: *Prenanthes autmnalis** from historical to historical (but based on an uncertain record). This rare species' inclusion in the county is based on a single collection from Centre Grove in Lawrence Twp. (Bayard Long 49738, 2 May 1937, PH). However, this specimen consists of a small, young, sterile plant that cannot be readily identified to species. The reported location in the southwestern area of the county for this Pinelands species is quite removed from the rest of the known locations (current and historical) in Atlantic, Burlington, Camden, Cape May and Ocean Counties (Hough 1983). Therefore, it seems appropriate to take *P. autumnnalis*' inclusion in the flora as being based on an uncertain record.

041. Add: *Pyrrhopappus carolinianus**, rare. This state-endangered species was discovered in the county by Linda Kelly in Downe Twp. SE of Dividing Creek and has been reported and observed from here since then (Moore 2004a, 2004b; Moore 5578). Prior to Kelly's discovery, the northern limit of this species range was Delaware (Gleason and Cronquist 1991).

042. Change status: *Senecio tomentosus** (\equiv *Packera tomentosa*) from historical to rare. Subsequent fieldwork in the county has led to the discovery of a number of populations for this rare species in the county in Maurice River Twp. (Moore 7052, 7260, 10932).

043. Change status: [*Senecio vulgaris*] from historical to frequent. Native to the Old World in Africa, Asia and Europe (Y.-L. Chen et al. 2011), this species is frequently encountered as a weed in farm fields and disturbed urban areas throughout the county (Moore 5247, 6558, 7024, 7751, 7791).

044, 045. Delete *Solidago arguta* var. *arguta* and *Solidago arguta* var. *boottii*.

Solidago arguta is not known from the county, all material referable to the two varieties above being referable to *Solidago tarda*.

046. Add *Solidago canadensis* var. *canadensis*, common. Inadvertently left off the original list, only *S. canadensis* var. *scabra* (= *S. altissima*) being given.

047. Add *Solidago rugosa* var. *celtidifolia*, occasional. Inadvertently left off the original list. Found in sandy, open wetlands, especially along the bayshore; recently observed in Haleyville. Specimens at PH: B. Long 4824, 4901, 25 Aug. 1910, NW of Dividing Creek along Port Norris Trolley; W. Stone 13259, 24 Aug. 1910, Beaver Dam.

048. Add *Solidago rugosa* var. *sphagnophila*, rare. Inadvertently left off the original list. Limited to the Pinelands areas of the county in acidic open wetlands associated with Atlantic white cedar; recently observed in the Manumuskin River and Manantico Creek watersheds. Specimens at PH: Bassett and Long s.n., 12 Aug. 1923, South Vineland, Sherman Ave.; B. Long 19472, 28 Sep. 1918, Cedar Branch, Manantico Creek, 1 mi. E of Main Ave.; B. Long 51524, 26 Sep. 1937, ca. 1 mi. E of Pleasantville, Burnt Mill Branch.

049. Add: *Solidago stricta**, historical (but based on an uncertain record). In the original list, this rare species was treated as a synonym of *Solidago sempervirens* var. *mexicana*. At CHRB there is a specimen of *S. stricta* (V. Abraitys, J. Edwards and E. Lapport, s.n., 1969) stated to be "S of Buena" in Cumberland Co. Caiazza and Fairbrothers (1980: 15) indicated

that this site was along a sandy roadside near Bennetts Mill (near the border of Vineland and Maurice River Twp. and the Atlantic Co. and Cumberland Co. border), which is approximately nine miles south of Buena. In Vince Abraitys' index card there is no report of *S. stricta* from Cumberland Co. (David Snyder, pers. comm.). Recent fieldwork in the Bennetts Mill area has not resulted in its discovery. Therefore, it is best to treat this record's precise location and *S. stricta*'s occurrence in the county as uncertain.

050. Add: *Solidago tarda, rare.** This rare species was treated under *S. arguta* var. *arguta* in the original list. It is known from a few sites in the eastern part of the county in Commercial Twp., Maurice River Twp., Millville and Vineland.

051. Add *Solidago uliginosa*, occasional. Inadvertently left off the original list. Found in open swamps and bogs, especially in the Pinelands section of the county. Over 15 specimens at PH, mostly from the eastern part of the county. In Stone (1911) it was referred to as *S. neglecta*. New Jersey was incorrectly omitted from the North American range of the species by Semple and Cook (2006).

052. Add *Solidago ulmifolia*, rare. Inadvertently left off the original list. Found in upland roadsides and woodland edges in the western areas of the county. Specimens at PH: *B. Long* 44257, 21 Aug. 1934, 1 mi. SE of Garton; *B. Long* 45571, 16 Sep. 1934, 1.5 mi. SW of Bridgeton; *B. Long* 47375, 15 Aug. 1935, 1.5 mi. SW of Bridgeton.

053. Change status: *Vernonia glauca from historical to rare.** This state-endangered species was rediscovered in the county in Gouldtown in Fairfield Twp. in 2004 (Moore 2006; Moore 6730). It was last reported from the county in the 1920s and 1930s near Bridgeton and Gouldtown (*Bayard Long* 3611, 34717, 34917, 45567, 47378, PH). Seed was collected from this population by Uli Lorimer, curator of Native Flora Garden at Brooklyn Botanic Garden, and plants are grown there.

Balsaminaceae

054. Add: [*Impatiens walleriana*], rare. Native to eastern Africa (Grey-Wilson 1980) and a commonly planted, this species observed clearly growing outside of cultivation in a disturbed wet woodland in the Manantico Creek watershed in Vineland (Moore 9257). This species has also been reported to have escaped from cultivation in the District of Columbia, Florida and Michigan, as well as Mexico; West Indies; Central America; South America; Asia; Australia (Moore et al., in press).

Berberidaceae

055. Add: [*Berberis thunbergii*]†, occasional. Native to Japan (Ohwi 1965), occasionally observed in disturbed woodlands in the northwestern region of the county, especially on soils in the Matapeake-Chillum-Mattapex association (Powley 1978) (Moore 10933). It was also observed in the eastern portion of the county in the Willow Oak Natural Area (Moore 10653) and Bennetts Mill in Vineland and the Peek Preserve in southern Millville.

Betulaceae

056. Add: *Carpinus caroliniana*, rare. Found in rich woodlands, known from a couple of sites in the western part of the county (Moore 7005, 7646), as well as one site in the southcentral portion of the county north of North Port Norris (Moore 11260).

Boraginaceae

057. Add: [*Myosotis discolor*], rare. Native to Europe (Grau and Merxmüller 1972), collected in an agricultural area along a roadside in Cedarville in Lawrence Twp. (*Moore* 5976). Differs from the next in having the inflorescence limited to the top half of the culm (as opposed to flowering to the base).

058. Change status: [*Myosotis stricta*] from rare to common. Native to Europe (Grau and Merxmüller 1972), now a common early spring weed, in dry open sandy fields and roadsides (*Moore* 5861, 5871, 6579, 7825, 9133), the roadsides taking on a bluish haze when the species is common and in bloom.

Brassicaceae

059. Add: [*Alliaria petiolata*]†, common. This invasive species, which is native to Europe (Ball 1993a), is found in disturbed areas throughout the county, but is more frequent in the western regions (*Moore* 7014, 9881, 10557, 10692).

060. Add: [*Berteroa incana*], rare. Native to Europe (Ball 1993b), known from one site as a roadside weed in Millville near Wheaton Village (*Moore* 4562).

061. Add: [*Capsella bursa-pastoris*], common. Native to Europe (Chater 1993) and ranked by Coquillat (1951) as the world's second most common weed, this species is a common weed throughout the county being found in open disturbed areas from rural to urban areas (*Moore* 5240, 5679, 5914, 5916, 6555, 7804).

062. Change status: [*Cardamine hirsuta*] from rare to common. Native to Asia (Zhou et al. 2001) and Europe (Jones et al. 1993), it is found in situations similar to the preceding but it can tolerate moister conditions. It is a common weed throughout the county (*Moore* 5681, 6533, 6552, 6556, 7010, 7809).

063. Add: [*Cardamine impatiens*]†, rare. Native to Asia (Zhou et al. 2001) and Europe (Jones 1993), recently found in a forested wetland in Stow Creek Twp. (*Moore* 9925) The first collection for this species in New Jersey was from 1990 (Glenn and Barringer 2004).

064. Add: [*Cardaria draba*], rare. Native to Asia (Zhou et al. 2001) and probably southern Europe (Ball 1993c), recently collected from Greenwich Twp. (*Moore* 6569) and Stow Creek Twp. (*Moore* 10080) in agricultural areas.

065. Change status: *Erophila verna* (≡*Draba verna*) from native to non-native. This species is native to Asia (Zhou et al. 2001) and Europe (Walters 1993a).

066. Add: [*Lunaria annua*], occasional. Native to southeastern Europe (Ball 1993d), it has been observed as an escape from cultivation at a number of sites throughout the county (*Moore*, 6572, 6992, 6993, 6994). *Lunaria rediva*, a similar non-native from Europe, has not been observed.

067. Add: [*Teesdalia nudicaulis*], common. Native to Europe (Clapham 1993), this species, which was not reported by Britton (1881, 1888) or Stone (1911) and was only regarded as

“local” by Fernald (1950: 701) and a “casual weed” by Gleason and Cronquist (1991: 183), has rapidly spread throughout the county (*Moore* 5307, 5695, 7135). It prefers open sandy areas, and when the plant is blooming in early April, large populations look like snow cover. Hough (1983) only reported it from Burlington and Ocean Cos.

Buxaceae

068. Add: [*Pachysandra terminalis*]†, rare. Native to Asia (Min and Brückner 2008), this species is rarely noted as a true escape from cultivation in the county (*Moore* 6974).

Cabombaceae

069. Add: *Cabomba caroliniana*†, rare. Observed in a pond in Millville (*Moore* 9890). Native to South America and North America at least into the southeastern United States (Wiersema 1997), this species was not mentioned by Britton (1881, 1889), Stone (1911) or Taylor (1915), but was mentioned in Keller and Brown (1905) as occurring in Camden Co. in Timber Creek. Fernald (1950) reported it as native to Virginia and adventive further north, whereas Gleason and Cronquist (1991) reported it as native to New Jersey and adventive further north. Riemer and Ilnicki (1968) did not find any evidence for viable seed production from New Jersey populations, the species entirely dependent on vegetative propagation, which may suggest it was introduced. The species is recognized as non-native and invasive in New York (New York Codes, Rules and Regulations Part 575.3(2)) and Pennsylvania (Pennsylvania Department of Conservation and Natural Resources 2014).

Callitrichaceae

070. Add: [*Callitriche stagnalis*], rare. Native to Europe (Schotsman 1972), recently collected in a pond in Vineland by Stephen Field (*Field s.n.*, BKL). At PH there are nine historical specimens (1923–1947) of this species from the eastern region of the county; four were originally misidentified as *C. palustris*.

071. Add: *Callitriche terrestris**, rare. Inadvertently left off the original list, the material at PH on loan when the original checklist was prepared. This rare species was collected twice in rich woods in Stow Creek Twp. (*Moore* 10112, 10250). Specimens at PH: *B. Long* 40338, 4 Jun. 1933, NW of Shiloh; *B. Long* 43211, 27 May 1934, 1.5 mi. NW of Deerfield; *B. Long* 54444, 2 Jun. 1940, N. of Bridgeton.

Caprifoliaceae

072. Delete: *Diervilla lonicera*. See Table 1. This species’ inclusion in the original checklist is based on a sight record for Millville by Edwin C. Jellett in Keller and Brown (1905). Stone (1911: 712–713) stated: “Mr. E. C. Jellett assures me that his record...is correct. He was familiar with the plant at the time, and although he preserved no specimen, he does not see how he could have mistaken anything for it. He was visiting the station for *Chionanthus* and found *Diervilla* growing with it.” There are no specimens at PH for this species from southern New Jersey. Jellett, who authored numerous publications of the flora of Germantown, published a note (1901) on *Nelumbo lutea* in New Jersey, which he said was locally known as “Woodstown lilies.” Specimens for this species from southern New Jersey at PH (all collected from the same site): Gloucester Co.: *B. Long* 25931, 6 Jul. 1922, SE of Mantua, Chestnut Branch of Mantua Creek; *B. Long* 27426, 16 Jun. 1923; *B. Long* 31861, 10 Oct. 1924.

073. Change status: [*Lonicera maackii*]† from rare to frequent. (Moore 7879).

074. Change status: [*Lonicera morrowii*]† from historical to frequent. (Moore 7134).

Native to Asia (Yang et al. 2011), both are now frequent throughout much of the county. Distinguishing between *L. morrowii*, *Lonicera tatarica* (also introduced from Asia) and *L. ×bella* (the purported hybrid between the two), can be quite challenging. Yang et al. (2011) recognized them as varieties, *L. tatarica* L. var. *tatarica*, *L. tatarica* var. *morrowii* (A. Gray) Q. E. Yang, Landrein, Borosova, & J. Osborne.

075. Add: [*Viburnum dilatatum*]†, occasional. (Moore 9336).

076. Add: [*Viburnum lantana*], occasional. (Moore 9915).

077. Add: [*Viburnum setigerum*], occasional. Specimens: (Moore 6792, 9528).

078. Add: [*Viburnum seiboldii*]†, occasional. (Moore 9978).

These non-natives, *V. dilatatum*, *V. setigerum*, *V. seiboldii* native to Asia (Ohwi 1965, Yang and Malécot 2011) and *V. lanatana* native to Europe (Ferguson 1976), are occasionally encountered in woodlands and edges of woodlands throughout the county.

Caryophyllaceae

079. Add: [*Holosteum umbellatum*], occasional. Native to Asia (Lu and Rabeler 2001) and Europe (Walters and Akeroyd 1993), recently observed as a weed in Hopewell Twp. (Moore 5246) and Millville (Moore 7824, 11354).

080. Add: [*Petrorhagia prolifera*], common. Native to Europe (Ball and Akeroyd 1993a), now common in the county, especially along disturbed sandy roadsides (Moore 4734, 6125, 7341).

081. Add: [*Silene latifolia*], occasional. Native to Europe (Chater et al. 1993), occasionally encountered as a weed along roadsides and in agricultural areas (Moore 7027).

082. Change status: *Silene stellata* from non-native to native. This species is native to New Jersey (Britton 1889, Stone 1911, Gleason and Cronquist 1991).

083. Add: [*Spergula morisonii*], occasional. Native to Europe (Ratter and Akeroyd 1993), occasionally found in open sandy areas (Moore 7040, 9115, 9125).

084. Add: [*Spergula pentandra*], rare. Native to Europe (Ratter and Akeroyd 1993), known from one site in Maurice River Twp. (Moore 5301). See Snyder (1987) for further discussion of this and the previous species' occurrence in New Jersey.

Celastraceae

085. Add: [*Celastrus orbiculatus*]†, frequent. Native to Asia (Zhang and Funston 2008), this invasive species is now frequently found in disturbed areas in the county.

086. Add: [*Euonymus alatus*]†, rare. Native to Asia (Ma and Funston 2008), this species, which is quite invasive elsewhere in New Jersey, has recently been observed in the Willow Oak Natural Area in Vineland (Moore 9963).

087. Add: [*Euonymus fortunei*]†, occasional. Native to Asia (Ma and Funston 2008), occasionally found in disturbed roadsides and woodland edges in the county. *Euonymus* material with evergreen or semi-evergreen leaves presents taxonomic problems (Ma 2001, Ma and Funston 2008). Most material is trailing or climbing, has small usually variegated leaves (2–4 cm.) and rarely flowers or fruits. This material, sometimes referred to as *E. radicans* (Siebold ex Miq.) Siebold ex Handel-Mazzetti or *E. fortunei* var. *radicans* (Siebold ex Miq.) Rehder, represents escaped cultivars or forms of *E. fortunei* (Ma 2001, Ma and Funston 2008).

Chenopodiaceae

088. Add: [*Bassia byssopifolia*], rare. Native to Europe (Ball and Akeroyd 1993b), recently observed in Shell Pile in open, wet, disturbed saline areas (Moore, 11323).

089. Add: [*Chenopodium botrys*] (≡*Dysphania botrys*), occasional. Native to Europe (Brenan and Akeroyd 1993), occasionally encountered in open disturbed areas (Moore 10102).

090. Change name: *Chenopodium leptophyllum* to *Chenopodium pratericola**. *Chenopodium leptophyllum*, a synonym of *C. dessicatum* from western Canada and United States (Clemants and Mosyakin 2003a), has been misapplied (e.g., Britton 1889, Stone 1911, Hough 1983) to material in New Jersey, which is properly referred to as *C. pratericola*, a rare species in New Jersey. Recently observed west of Port Norris in wet, open areas associated with recent salt hay farming (Moore 2015; Moore 11626).

091. Change status: [*Chenopodium pumilio*] (≡*Dysphania pumilio*) from historical to occasional. Native to Australia (Clemants and Mosyakin 2003b), occasionally encountered in open disturbed areas (Moore 10304).

092. Add: [*Kochia scoparia*] (≡*Bassia scoparia*), rare. This species native to the Old World (Zhu et al. 2003) has been reported from moist, disturbed saline areas at Moores Beach in Maurice River Twp. (Moore 2004b; Moore 5212), Shell Pile in Commercial Twp. (Moore 11303) and West of Port Norris (Moore 2015).

093, 094. Change name and status: *Suaeda depressa* var. *depressa*, historical to *Suaeda calceoliformis**, rare. In the original checklist the name *Suaeda depressa* var. *depressa* was misapplied to material referable to *Suaeda calceoliformis*, a rare species in New Jersey. This rare species has been observed recently in Moores Beach, Thompsons Beach (Moore 2015; Moore 5580) and Shell Pile (Moore 11245).

Clusiaceae

095. Change status: *Hypericum gymanthum** from historical to rare. A population for this endangered species was discovered near Gum Tree Corner in Stow Creek Twp. (Moore 2006; Moore 6700). The species previously was reported near Garton in Deerfield Twp. (Bayard Long 44278, 21 Aug. 1934, PH; rediscovered by David Snyder, see Snyder 2000),

Bennetts Mill in Maurice River Twp. (*Bayard Long 55880*, 13 Jan. 1941, PH), Vineland (*Bayard Long 46919, 46923, 46924*, 25 Jul. 1935, PH) and northern Vineland near the Blackwater Branch (*Bayard Long 47305*, 13 Aug. 1935, PH).

Commelinaceae

096. Add: [*Murdannia keisak*]†, rare. Native to Asia (Hong and DeFilipps 2000), observed in open freshwater tidal marshes along the Maurice River below the Union Lake Dam (Moore and Brecht 2013; *Goldman 4125*; *Moore 9999, 11372*). Three populations have been observed and two populations have increased substantially since 2010 when they were first discovered (Lorimer and Moore 2015a). Prior to its discovery in Cumberland Co., this species, which can be highly invasive (Dunn and Sharitz 1990), was not known north of Sussex Co., Delaware.

Convolvulaceae

097. Change status: *Cuscuta coryli** from historical to rare. This rare parasitic species is known from a vernal pond in an agricultural field near Main Road Station (*Moore 7511*; Snyder 2000; Scagnelli and Moore 2009) and in a moist open wetland in a field between Cedarville and Centre Grove in Lawrence Twp. At these sites, the host species have been composites, including the rare *Coreopsis rosea* (Main Road Station only). It was also historically known from the Main Road Station site (*Bayard Long 47168, 47181*, 8 August, 1935, PH). Snyder (2000) also reported it southeast of Garton in Deerfield Twp.

098. Add: *Cuscuta polygonorum**, rare. This rare species has recently been reported from the county (New Jersey Natural Heritage Program 2014). See Snyder (2000) for additional records for this species in New Jersey.

099. Change name: [*Ipomoea nil*] to [*Ipomoea hederacea*]. In the original checklist, the name *I. nil* was misapplied to material of *I. hederacea*.

100. Add: [*Ipomoea lacunosa*], rare. Native to the southeastern U.S., possibly north to Delaware (Tatnall 1946) and Pennsylvania (Rhoads and Block 2007). Britton (1889) and Stone (1911) did not treat the species as native to New Jersey, Britton (p. 179) regarding it as a “fugitive from the South” and Stone (p. 653) as an “entirely introduced species within our limits.”

101. Add: [*Ipomoea purpurea*], frequent. Inadvertently left off the original list. Native to the New World tropics (Gleason and Cronquist 1991) and commonly planted, this species is frequent in disturbed, dry, open areas (*Moore 7645*). Specimens at PH: *G. Bassett and B. Long s.n.*, 12 Aug. 1923, N. of Vineland; *B. Long 41297*, 28 Jul. 1933, NW of Shiloh.

Cornaceae

102. Add: [*Cornus kousa*], rare. Native to Asia (Rehder 1940), recently observed as an escape from cultivation in Stow Creek Twp. (*Moore 9954*).

Crassulaceae

103. Add: [*Sedum acre*], occasional. Native to Europe (Webb et al. 1993a), observed at a few sites in Millville (*Moore 10362*) and Vineland in dry open areas near sidewalks.

104. Add: [*Sedum album*], rare. Native to Europe (Webb et al. 1993a), observed at one site in Millville (*Moore 11464*) along the edge of an upland field.

105. Add: [*Sedum telephium*] (\equiv *Hylotelphium telephium*), rare. Native to Eurasia (Webb et al. 1993a; Fu and Hideaki 2001), observed at a two sites in Millville (*Moore 11182*) and Vineland in in upland roadsides.

Cyperaceae

106. Add: *Carex aggregata**, undetermined. This species was reported by the New Jersey Natural Heritage Program (2014) in a list of rare species reported for the county. The species is tracked imperiled as by the New Jersey Natural Heritage Program (Snyder 2013).

107. Add: *Carex crinita* var. *brevicrinis*, occasional. This variety was inadvertently left off the original checklist.

108. Add: *Carex livida*, rare. This species, found in open wetlands in the Pinelands area of the county, was inadvertently omitted from the original checklist.

109. Add: *Carex vestita*, occasional. This species, found in dry to moist sandy woodlands and woodland edges, was inadvertently omitted from the original checklist.

110. Add: [*Cyperus difformis*], rare. Native to the Old World (Africa, Asia, Australia and possibly Europe; DeFillips 1980, Tucker et al. 2002, Dai et al. 2010a), first discovered in the county by Mary Leck in a gravel pit in Vineland (*Moore 5593*). It was later discovered at another site SSE of Carmel in Millville in a wet area of a fallow farm field (*Moore 10138*).

111. Add: [*Cyperus iria*]†, occasional. Native to the Old World (Asia, Africa, Australia; Tucker et al. 2002, Dai et al. 2010a), this species has been observed at several sites in the county in disturbed, open, moist areas (Lorimer and Moore 2015b; *Moore 5044, 6755*).

112. Add: [*Cyperus microiria*], occasional. Native to Asia (Tucker et al. 2002, Dai et al. 2010a), this species has been observed at several sites in the county in disturbed, open, moist areas (*Moore 10145, 11139*).

113. Add: *Cyperus pseudovegetus**, rare. This state-endangered species was discovered by Mike Feder in a wet, open area near along a powerline right-of-way near the Sherman Avenue bog site during a joint trip of the Philadelphia Botanical Club and Torrey Botanical Society (Lorimer and Moore 2015b; *Moore 11335*).

114. Add: *Eleocharis minima**, historical. Bayard Long's 1940 collection from a vernal pond near Main Road Station in Vineland is the only record of this species from New Jersey. The identification of the specimen was verified by Henry Svenson, an authority in *Eleocharis*. This species, which occurs in South and Central America, has an unusual distribution in the U.S. being reported from Florida, Maryland, New Jersey and Texas (Smith et al. 2002).

115. Add: *Eleocharis olivacea* var. *reductiseta**, rare. This rare taxon occurs in freshwater tidal marshes in the county (Schuyler and Ferren 1975, Ferren and Schuyler 1980).

116. **Change status:** *Eleocharis parvula* from historical to occasional. This diminutive species is found in freshwater tidal wetlands (Ferren and Schuyler 1980; *Moore 11302, 11303*).

117. **Add:** *Eleocharis rostellata*, rare. One population is known along the edge of a salt marsh in Sayres Neck in Lawrence Twp. (*Moore 10987*). There is also one specimen at PH: *B. Long 43360*, 14 Jun. 1934, Strathems Neck, along Stow Creek.

118. **Change status:** *Eleocharis tortilis** from historical to rare. This state-endangered species was historically known near Sherman Ave. bog (*Bayard Long, 1923, PH*) in Vineland; it was rediscovered there in 2013 during a joint field trip of the Philadelphia Botanical Club and Torrey Botanical Society (Lorimer and Moore 2015b; *Moore 11349*) in 2014. The species occurred not in the open bog but in the Atlantic white cedar swamp adjacent to the bog.

119. **Add:** [*Kyllinga gracillima*] (\equiv *Cyperus brevifolioides*), rare. Native to Asia (Tucker 2002, Dai et al. 2010b), this species has been observed from freshwater tidal marshes in Millville along the Maurice River below the Union Lake dam (Moore and Brecht 2013; *Moore 9837, 10000*) and the Manantico Creek below the railroad (Lorimer and Moore 2015a; *Moore 11339*). Previously, the name *Cyperus brevifolius* (\equiv *K. brevifolia*), a species native to the southeastern U.S. (as well as Africa, Asia, Australia, Central America, South America) was misapplied to material of *K. gracillima* in Connecticut, Delaware, Maryland, New Jersey, Pennsylvania and Virginia (Tucker 2002, see Fernald 1950, Gleason and Cronquist 1963, Hough 1983 for examples). Dai et al. (2010b) treated *K. gracillima* as a variety, *K. brevifolia* var. *leiolepis* (Franch. & Sav.) H. Hara. A *Kyllinga* has also been observed in the county as a lawn weed. This material requires further study to determine if it represents diminutive material of this species or true *K. brevifolia*.

120. **Add:** *Schoenoplectus maritimus** (\equiv *Scirpus maritimus*), rare. This rare species is reported from Cumberland Co. by the New Jersey Natural Heritage Program (2014). Fairbrothers and Hough (1973: 45) treated this species as “rare” and “recently collected in Burlington and Cumberland Cos.” It was recently observed in an open wetland south of the Sherman Ave. bog site. (*Moore 10721*).

121. **Add:** *Schoenoplectus smithii** (\equiv *Scirpus smithii*), rare. This rare species was discovered by Ted Gordon on a Philadelphia Botanical Club field trip (Scagnelli and Moore 2009; *Moore 7508*) in a vernal pond near the Main Road Station.

122. **Change name:** *Scirpus cylindricus* to *Schoenoplectus novae-angliae**. In the original checklist the illegitimate later homonym *Scirpus cylindricus* (Torrey) Britton 1892, non (Vahl) Lam. 1817 was used for this rare species. The correct name is *Schoenoplectus novae-angliae* (Britton) M. T. Strong [\equiv *Scirpus novae-anglicae* Britton; *Bolboschoenus novae-angliae* (Britton) S. G. Smith.].

123. **Add:** *Scleria pauciflora* var. *caroliniana**. This rare taxon was discovered by Ted Gordon at a site SW of Cumberland Pond in eastern Millville (*Moore 7520*). The culms, leaves and bracts were copiously hairy, thus making this material *S. pauciflora* var. *caroliniana*

as opposed to the glabrous (or nearly so) *S. pauciflora* var. *pauciflora* (Reznicek et al. 2002), which is rarer in New Jersey (Snyder 2013).

124. Change name: *Scleria reticularis* var. *pubescens* to *Scleria muhlenbergii*.

125. Add: *Scleria reticularis**, rare. The taxonomy of this and the preceding, primarily distinguished by achenes with tufts or lines of pubescence in *S. muhlenbergii* and achenes glabrous in *S. reticularis*, is controversial. Some treat this complex as a single species, *S. reticularis*, with no varieties (e.g., Gleason and Cronquist 1991), others a single species with two varieties (e.g., Stone 1911, Gleason and Cronquist 1963) and still others as two distinct species (Britton 1881, 1889, Taylor 1915, Fernald 1950). Reznicek et al. (2002) recognized the two as distinct species, *S. muhlenbergii* being distributed throughout much of the eastern U.S., as well as Central America, northern South America and the West Indies and *S. reticularis* being limited to the eastern U.S. See Moore (2002) for a discussion of the various names that have been applied to these two taxa in earlier works on the New Jersey flora.

Elaeagnaceae

126. Add: [*Elaeagnus angustifolia*], rare. Native to Asia (Qin and Gilbert 2007), recently found at one site near Pine Mount in Greenwich Twp. (*Moore 11431*).

Elatinaceae

127. Add: *Elatine minima**, rare. This rare species is reported from Cumberland Co. by the New Jersey Natural Heritage Program (2014). Recently collected from a sandy edge of a borrow pit near Dividing Creek (*Moore 11175*). There is also one specimen at PH: B. Long 50369, 2 Jul. 1937, Sunset Lake.

Euphorbiaceae

128. Change status: *Chamaesyce vermiculata* from historical to rare. This species was collected along a roadside NE of Bay Point in Lawrence Twp. (*Moore 7685*).

129. Change status: *Crotonopsis elliptica* (≡*Croton wildenovii**; *Crotonopsis michauxii* var. *ellipticus*) from historical to rare. A few populations of this rare species have been observed in open, sandy uplands in eastern Maurice River Twp. (*Moore 9954, 10009, 11232*).

130. Change status: *Euphorbia corollata** from rare to historical. No extant populations are currently known for this state-rare species. There is only one specimen from the county at PH: B. Long 48875, 12 Jul. 1936, ca. 0.5 mi. SW of Cohansey.

131. Add: [*Euphorbia helioscopia*], occasional. Native to Europe (Smith and Tutin 1968), observed at a number of sites in the western part of the county in open disturbed areas (Brecht and Moore 2013a; *Moore 10626*).

132. Add: [*Euphorbia lathryis*], rare. Native to Europe in the Mediterranean region (Smith and Tutin 1968), this striking species (it can be over 1 meter tall) has been observed in disturbed uplands in eastern Millville (*Moore 6646*) and a roadside W of Husted in Upper Deerfield Twp. (*Moore 6941*).

133. **Change status:** [*Ricinus communis*] from historical to rare. Native to northeastern Africa and the Middle East but now cultivated and escaped throughout the world (Mabberley 2008), a population of castor bean was discovered in Maurice River Twp. in a disturbed area along a gravel road E of Jones Mill in Maurice River Twp. (*Moore 9535*).

Fabaceae

134. **Change status:** *Amphicarpaea bracteata* from frequent to rare. Only currently known from a couple of sites in Stowe Creek Twp.

135. **Add:** [*Amorpha fruticosa*]†, rare. Observed in disturbed areas near tidal river in the western part of the county near Sea Breeze (*Moore 9922*). Heckscher (1994: 105) also reported it as an “important member of the strand community” in the Florence Jones Reineman Wildlife Sanctuary and Fortescue Glades Refuge in Downe Twp. This species was not mentioned in Stone (1911) but was cited by Britton (1889: 82; but not mentioned in 1881) from Essex, Hudson and Passaic Cos. Britton treated this species as non-native “fugitive of the West.” Keller and Brown (1905: 198) treated it as “escaped from cultivation.” The species is also treated as non-native in Delaware (Tatnall 1946), New York (Weldy et al. 2014) and Pennsylvania (Rhoads and Block 2007; Rhoads and Klein 1993, however, recognized it as native).

136. **Add:** [*Baptisia australis* var. *australis*], rare. This species is adventive in New Jersey, being native to the west and south of the state (Gleason and Cronquist 1991). It was found at one locality in southern Millville in a moist open area (*Moore 11151*).

137. **Add:** *Cercis canadensis**, rare. Known from three roadside sites (Bennetts Mill in Maurice River Twp., N. of Leamings Mill in Vineland, E of Carmel in Vineland). The species is listed as endangered in New Jersey (Snyder 2013). However, the material from the county likely represents escapes from cultivation.

138. **Add:** *Desmodium humifusum**, undetermined. This species was reported by the New Jersey Natural Heritage Program (2014) in a list of rare species reported for the county. The species is tracked as endangered by the New Jersey Natural Heritage Program (Snyder 2013). Based on allozyme evidence, Raveill (2002) reported *D. humifusum* to represent a hybrid resulting from crosses of *D. paniculatum* and *D. rotundifolium*.

139. **Change status:** *Lupinus perennis* var. *perennis** from frequent to rare. While characterized as frequent or common in earlier floras (Britton 1881, 1889; Stone 1911; Taylor 1915), the species is now only rarely encountered today, many previously known populations, often along roadsides, are now gone.

140. **Add:** [*Melilotus alba*], common.

141. **Add:** [*Melilotus officinalis*]†, common.

This and the preceding species, common weeds native to Asia (Wei and Vincent 2010) and Europe (Hansen 1968), were inadvertently omitted from the original checklist.

142. Add: *Phaseolus polystachyos* var. *polystachyos**, undetermined. This species was reported by the New Jersey Natural Heritage Program (2014) in a list of rare species reported for the county. The species is tracked as imperiled by the New Jersey Natural Heritage Program (Snyder 2013).

143. Add: [*Pueraria montana* var. *lobata*]†, rare. Native to Asia (Wu and Thulin 2010), a population of this species, which is highly invasive in the South, was discovered along the edge of a farm field in Greenwich Twp. (Moore 6936).

144. Add: [*Senna obtusifolia*] (\equiv *Cassia obtusifolia*), rare. Observed by Brett Roberts as a weed in Heislerville in an open, sandy dry area adjacent to a home (Moore 7656). This pantropical species is likely native in the Southeast but certainly adventive in the Northeast.

145. Add: [*Strophostyles leiosperma*], rare. Native to the United States in the Midwest, Southeast and Southwest (Gleason and Cronquist 1991) but likely adventive in New Jersey (Snyder 1990). It was recently observed in dry open areas along the railroad between the Millville Industrial Park and Manumuskin Station (Lorimer and Moore 2015a; Moore 11626).

146. Add: [*Vicia cracca*], occasional. This blue-flowered vetch, native to Europe (Ball 1968), is occasionally encountered in disturbed fields and roadsides in the county (Moore 5348, 5913).

147. Add: [*Vicia tetrasperma*], frequent. This small white-flowered vetch, native to Europe (Ball 1968) and Asia, is frequent in open disturbed uplands in the county (Moore 5912).

Fagaceae

148. Delete: *Quercus* \times *heterophylla*. The application of this name, first published as a species by François-André Michaux (1812) and typified with a color plate based on material discovered by John Bartram along the Schuylkill River, has varied, sometimes being recognized as a species and other times being recognized as a hybrid with numerous species being hypothesized as the parents (see Martindale 1880, Trelease 1915 and Palmer 1948 for reviews). Today, this name is generally applied to the hybrid between *Quercus phellos* and *Q. rubra* (Gleason and Cronquist 1991, Jensen 1997). While material has been examined from the county that has leaves similar to those in Michaux's plate of *Q. heterophylla*, *Q. rubra* is exceptionally rare in the county. Therefore, the material in the county likely represents a hybrid between *Q. phellos* and another species of *Q.* sect. *Lobatae*, possibly *Q. falcata* (*Q.* \times *ludoviciana*, *Q.* \times *subfalcata*) or *Q. velutina* (*Q.* \times *filialis*).

Other *Quercus* hybrids

Unlike the pines (*Pinus*), no attempt was made to document *Quercus* hybrids observed in the county, since hybridization in the wild between *Quercus* is well documented, unlike *Pinus*. Hybrid oaks are occasionally encountered in the county.

149. Delete: *Quercus imbricaria**. This state-endangered species was included on the original checklist on the basis of a single specimen collected from south of Haleyville in Commercial Twp. (Bayard Long 41711, 16 Aug. 1933, PH). However, further examination

of this specimen indicates that it is not *Q. imbricaria* but, like the material that has been identified as *Q. ×heterophylla*, probably represents a hybrid involving *Q. phellos* and another species of *Q.* sect. *Lobatae* (see also Snyder 1994).

150. Add: *Quercus lyrata**, rare. A population of this endangered species was discovered by Brett Roberts in a swampy woodland NNW of Heislerville in Maurice River Twp. (Moore 8316).

151. Change status: *Quercus prinoides* from common to occasional. This species was inadvertently listed as common in the original checklist.

Gentianaceae

152. Add: [*Centaurium pulchellum*], rare. Native to Europe (Melderis 1972), discovered by Stephen Field in a moist field in eastern Vineland (Stephen Field s.n. BKL).

153. Change status: *Sabatia difformis* from historical to rare. Currently known from a few vernal ponds and boggy wetlands in the Pinelands area of the county in Maurice River Twp. (Moore 10811).

Geraniaceae

154. Add: [*Geranium pusillum*], occasional. Native to Europe (Webb and Ferguson 1968), occasionally encountered in open, dry disturbed areas (Moore 5252, 5755).

Haloragidaceae

155. Add: [*Myriophyllum aquaticum*]*†, rare. Native to South America, a number of large populations are known in Vineland along the upper portions of Manantico Creek above Leamings Mill; (Moore 9256). A smaller population is known along the Parvins Branch near its confluence with the Maurice River (Moore 11149). The U.S. Fish and Wildlife Service has been working to control the populations along the Manantico Creek. The larger populations are in areas that have been impacted by hypertrophication.

Hydrocharitaceae

156. Add: *Elodea nuttallii*, rare. This species was collected in Millville along the Manantico Creek in a freshwater tidal pond below the railroad (Moore 10502)

Iridaceae

157. Change status: *Sisyrinchium fuscatum (= *S. arenicola*) from historical to rare.** This rare species has been observed in dry, sandy open areas in Millville and Vineland (Moore 10323). In previous treatments (e.g., Gleason and Cronquist 1963), in which many of the species originally described by E. P. Bicknell (e.g., 1899) were held as distinct, this material was known as *S. arenicola* E. P. Bicknell. Cholewa and Henderson (2002) relegated many of Bicknell's names to synonymy under *S. fuscatum* E.P. Bicknell including: *S. arenicola*, *S. farwellii*, *S. incrustatum*, *S. rufipes* and *S. tenellum*.

158. Add: *Sisyrinchium mucronatum*, occasional. Inadvertently left off the original list.

Juncaceae

159. Add: *Juncus biflorus*, occasional. This species, occasionally encountered in bogs and other acidic wetlands, was inadvertently left off the original checklist.

160. Change status: *Juncus caesariensis** from historical to rare. This state-endangered species has been observed in Vineland along the Parvin Branch at the Sherman Ave. bog (Moore and Brecht 2013; Moore 9934). This is also the only historical location in the county for this species (Bayard Long and George Bassett s.n., 12 Aug. 1923, PH).

161. Add: *Juncus gerardi*, frequent. This species, a common component of the salt marsh flora in the county, was inadvertently left off the original checklist.

Lamiaceae

162. Add: [*Ajuga reptans*], rare. Native of Europe (Ball 1972a), observed along open, dry roadsides in Fairfield and Stow Creek Twps. (Moore 10503, 10727).

163. Add: *Cunila origanioides*, rare. Inadvertently left off the original list.

164. Add: [*Lamium purpureum*], common. Native to Europe (Ball 1972b), this common weed was inadvertently left off the original checklist.

165. Change name: *Lycopus americanus* to *Lycopus americanus* var. *americanus*.

166. Add: *Lycopus americanus* var. *longii**, rare. This rare taxon was observed in a wet, open area adjacent to a farm field NW of Gum Tree Corners in Stow Creek Twp. (Moore 6698, 6715). The material is readily distinguished from the typical variety by its long, white spreading pubescence and leaves which are only remotely serrate (Benner 1935, Fernald 1950). One specimen at PH: B. Long 29683, 6 Oct. 1923, Deerfield along Harrow Run.

167. Add: [*Nepeta* ×*faassenii*], rare. A population of this horticultural hybrid was observed along a gravel road NE of Laurel Lake (Moore 9337). It clearly was not cultivated or a remnant of cultivation. While not previously reported to be escaped in the U.S., *N. ×faassenii* has been reported to escape in Europe and New Zealand (Healy 1958, Turner 1972). This nothotaxon is believed to be the result of crossing between *Nepeta nepetella* L. and *Nepeta racemosa* Lam. (= *N. mussinii* Spreng. ex Henckel) (Bailey 1949). *N. ×faassenii* differs from the cultivated *N. racemosa*, which has been reported as an escape from New York (Weldy et al. 2014), by its shorter stature (up to 3.8 dm.; material collected in county was only 1.5 dm. tall) and coarse leaves with crenate-serrate margins. *N. ×faassenii* differs from the common catnip, *N. cataria* L., by its shorter stature and blue (as opposed to white) corollas (Bailey 1949).

168. Add: *Pycnanthemum incanum* subsp. *incanum*, historical. There are five specimens at PH from the western part of the county (Greenwich, Marlboro, Sayres Neck) from open uplands habitats. Not recently observed.

169. Change status: *Pycnanthemum tenuifolium* from historical to rare. This species is historically known from the western part of the county from woodland edges (six

specimens at PH). It was recently observed in the eastern area of the county from a dry, sandy open area under a power line right-of-way northeast of the town of Cumberland in the headwaters of the Lawrens Branch, a tributary of the Manumuskin River.

170. Add: *Pycnanthemum verticillatum*, historical. Historically reported from the Main Avenue Station in Vineland (B. Long 46627, 12 Jul. 1935).

Lemnaceae

171. Add: *Wolffia columbiana*, occasional?.

172. Add: *Wolffia brasiliensis* (= *W. papulifera*, *W. punctata*), occasional?.

Wolffia material is encountered in ponds and lakes and occasionally slow moving streams, especially in areas where there has been hypertrophication. Two species have been identified from the county, but further work is needed to better understand the frequency of each.

Lentibulariaceae

173. Add: *Utricularia biflora**, undetermined. This species was reported by the New Jersey Natural Heritage Program (2014) in a list of rare species reported for the county. The species is tracked as endangered by the New Jersey Natural Heritage Program (Snyder 2013).

174. Add: *Utricularia resupinata**, rare. This state-endangered species was discovered by Brett Roberts at two abandoned borrow pits in Maurice River Twp. (Moore 8843a, 8843b).

Liliaceae

175. Change status: *Amianthium muscitoxicum** from historical to rare. This state imperiled species was historically known from the western part of the county in Stow Creek Twp. in rich soils, last collected in 1936 (B. Long 45677, 45990, 48864). It was rediscovered in the county in 2015 by the first author and Uli Lorimer (later visited by the Philadelphia Botanical Club) northeast of the town of Cumberland. The habitat was much different than the previously reported locations from the county, the species occurring in an open, sandy, moist, recently burned pitch pine forest, in association with *Calopogon tuberosus*, *Chasmanthium laxum*, *Polygala lutea*, *Rhynchospora capitellata* and *Scleria triglomerata*. Britton (1889; repeated in Keller and Brown 1905) and Stone (1911) reported the species from Vineland, Britton citing it on authority of Mary Treat, Stone indicating there was a specimen at the New Jersey State Museum (specimen has not been located). Briggs (1930), also reported it from Vineland with "(T)" after the location; Briggs did not explain the "T" but it no doubt refers to Mary Treat. Like this new record, this historical record from Vineland may have also represented a population from the Pinelands.

176. Add: [*Hyacinthoides non-scripta*, rare]. Native to Europe (Heywood 1980), this cultivated species was found along a roadside in Stow Creek Twp. near Gum Tree Corners (Moore 7028, 7029).

177. Change status: *Maianthemum stellatum* (≡ *Smilacina stellata*) from occasional to historical. Historically known from only one site at Sea Breeze.

Lythraceae

178. Add: [*Lythrum salicaria*]†, occasional. Native to Europe (Webb 1968b), this species, which can be highly invasive elsewhere, is occasionally encountered in the county in disturbed, open wetlands, especially in areas that have experienced nutrient input.

Melastomataceae

179. Add: *Rhexia mariana* var. *ventricosa**, rare. This rare species was observed in an open, wetland adjacent to a farm field NW of Gum Tree Corner in Stow Creek Twp (Moore 6734). See Snyder (1994, 1996) for a further discussion of this species in New Jersey.

Moraceae

180. Add: [*Humulus lupulus* var. *lupulus*], rare. This taxon, native to Asia (Zhou and Bartholomew 2003) and Europe (Tutin and Akeroyd 1993a), was noted along a moist, open roadside south of Laurel Lake (Moore 9989).

181. Add: [*Humulus scandens*] (= *Humulus japonicus*)†, rare. Native to Asia (Zhou and Bartholomew 2003), this species has been observed in open disturbed areas in Bridgeton, Millville, Port Norris and Vineland (Moore 9168).

182. Change status: *Morus rubra* from frequent to rare. The bulk of *Morus* encountered in the county is the non-native *Morus alba*, the native *Morus rubra* only rarely being encountered near the bayshore and western areas of the county (Moore 10603).

Nymphaeaceae

183. Delete: *Nuphar lutea* subsp. *pumila*.

184. Delete: *Nuphar lutea* subsp. *variegatum*.

185. Add: *Nuphar advena*, frequent.

186. Add: *Nuphar microphylla**, historical.

187. Add: *Nuphar rubrodisca*, rare.

188. Add: *Nuphar variegata*, frequent.

In order to better report on the diversity of *Nuphar*, the taxonomy and nomenclature now follows Wiersema and Hellquist (1997). *N. advena* and *N. variegata* are the two species most frequently encountered, the former with chiefly emersed leaves with terete or slightly flattened petioles and the latter with chiefly floating leaves with petioles adaxially flattened. Rarely, in freshwater nontidal and freshwater tidal areas, material that is similar to *N. variegata* is encountered but with red stigmatic disks, the constriction below the disk being greater than 5 mm. in diameter. This material (Moore, 10014, 10107) has been referred to as *N. rubrodisca*, which is sometimes taken to be a hybrid between *N. microphylla* and *N. variegata* (e.g., Fernald 1950). *N. microphylla*, slenderer in all aspects than the other species, has red stigmatic disks, like *N. rubrodisca*, but the sepals should be consistently five (not 6) and the constriction below the disk less than 5 mm in diameter. *N. microphylla* was historically reported from the county in Sunset Lake in Bridgeton (Bayard Long 50354, 2 Jul. 1937, PH) and Cumberland Pond in Maurice River Twp. (Bayard Long 38505, 18 Sep. 1932, PH).

Oleaceae

189. Add: [*Forsythia suspensa*], rare. Native to Asia (Chang et al. 1996), this commonly planted species was seen as an escape in a woodland in Stow Creek Twp. (Moore 10222). Most populations encountered represent remnants of past cultivation and not true escapes. Also, the commonly cultivated *F. ×intermedia* and *F. viridissima* have not been seen as escapes but have been encountered as cultivated remnants.

190. Add: [*Ligustrum obtusifolium*]†, frequent. Native to Asia (Chang et al. 1996) and occasionally cultivated, this species has been observed throughout the county, especially in disturbed upland woods, woodland edges and roadsides (Moore 9341). *L. obtusifolium* can be distinguished from *L. vulgare*, native to Europe (Green 1972) and also frequent in the county, by its leaves being pubescent on the midrib of the abaxial surface (glabrous in *L. vulgare*) and corolla tubes being 5 mm. or longer (up to 3 mm. in *L. vulgare*) (Rehder 1940). Other privets reported to occasionally escape, *L. amurense* (= *L. obtusifolium* subsp. *suave*), *L. ovalifolium* and *L. sinense* have not been observed.

Orchidaceae

191. Change status: *Isotria verticillata* from historical to rare. A population near Milmay in Maurice River Twp. was shown to the first author by Alex Mathie.

192. Add: [*Epipactis helleborine*], rare. Native to Asia (Chen et al. 2009) and Europe (Moore 1980), observed along the edge of a woodland near Laurel Lake (Moore 10578).

Papaveraceae

193. Add: [*Fumaria officinalis*], historical. Native to Europe (Sell 1993), historically collected from the county. Specimens at PH: G. N. Best s.n., Jul. 1886, Bridgeton; B. Long 41195, 10 Sep. 1933, Heislerville towards East Point; B. Long 43347, 3 Jun. 1934; East Point. Not recently observed.

Plantaginaceae

194. Add: *Plantago pusilla**, undetermined. This species was reported by the New Jersey Natural Heritage Program (2014) in a list of rare species reported for the county. The species is tracked as endangered by the New Jersey Natural Heritage Program (Snyder 2013).

Plumbaginaceae

195. Change status: *Limonium carolinianum* from rare to frequent. This species is a frequent species of the salt marsh flora.

Poaceae

196. Add: *Alopecurus carolinianus**, rare. This rare species was found in Sunset Lake in Bridgeton in 2013 when the lake was drained due to damage to the lake's dam (Moore 11378). The species was abundant in an open marsh in an area that would normally be inundated with water.

197. Change status: *Ammophila breviligulata* from common to rare. This species is limited to the dune areas of the bayshore region.

198. Change name: *Andropogon elliottii* to *Andropogon gyrans**.

199. Add: *Aristida dichotoma* var. *curtissii**, rare. This rare taxon was found in dry, open areas along a power line right-of-way in Vineland (Moore 5589).

200. Change name: *Aristida dichotoma* to *Aristida dichotoma* var. *dichotoma*

201. Add: *Bouteloua curtipendula**, rare. This endangered species was found at Sea Breeze in Fairfield Twp. during a joint Philadelphia Botanical Club and Torrey Botanical Society field trip (Moore 2015; Moore 11667). It was growing in an open sandy area in an area where homes were recently demolished. Further research is being conducted to determine if this population came from a non-native source, such as a commercial seed mix.

202. Add: [*Bromus hordaceus*], rare. Native to Europe (Smith 1980), recently collected at one site along an open sandy roadside in Milmay in Maurice River Twp. near the Atlantic Co. border. (Moore 7243).

203. Change status: *Calamovilfa brevipilis** (*=Sporobolus brevipilis* (Torr.) P.M.Peterson) from historical to rare. This species was historically known from the county only from a single collection (Long 41171) collected in the Tuckahoe River watershed near Hunters Mill in Maurice River Twp. In June 2015, northeast of the town of Cumberland, a small population consisting of approximately six sterile clumps was discovered by the first author and Ted Gordon in a sandy, moist open area in a powerline right-of-way in the headwaters of the Lawrens Branch, a tributary of the Manumuskin River.

204. Add: *Chasmanthium latifolium**, undetermined. This species was reported by the New Jersey Natural Heritage Program (2014) in a list of rare species reported for the county. The species is tracked as critically imperiled by the New Jersey Natural Heritage Program (Snyder 2013).

205. Add: [*Chloris verticillata*], common. Native to the Midwest (Barkworth 2003a), this adventive species has recently spread rapidly in the county, being most abundant in sandy, open uplands, especially along roadsides (Brecht and Moore 2011, 2013b).

206, 207. Change name and status: Change name from [*Cynodon dactylon*] to [*Cynodon dactylon* var. *dactylon*] and status from rare to frequent. Native to the Old World (Barkworth 2003b), this commonly planted pasture and lawn grass, is frequently encountered as an escape in dry, open disturbed areas, especially along roadsides and railroads (Moore 4727).

Dichanthelium

In order to better reflect the diversity of *Dichanthelium* encountered in the county and to be more in line with the taxa recognized by the New Jersey Natural Heritage Program, the taxonomy now follows LeBlond (2012).

208. Delete: *Dichanthelium acuminatum* var. *acuminatum*.

209. Delete: *Dichanthelium acuminatum* var. *implicatum*.

210. Add: *Dichanthelium acuminatum* var. *lindheimeri*, frequent. *D. acuminatum* var. *lindheimeri* was inadvertently left off the original checklist; it is frequently encountered in dry sandy habitats (Moore 6740).

211, 212. Change name and status: *Dichanthelium acuminatum* var. *densiflorum* to *D. spretum* and common to occasional. This species is limited to vernal ponds and acidic wetlands in the eastern part of the county (Moore 2587, 5467, 8842).

213. Change name: *Dichanthelium acuminatum* var. *villosum* to *D. villosissimum*.

214, 215. Change name and status: *Dichanthelium acuminatum* var. *wrightianum* to *D. wrightianum* (\equiv *Panicum wrightianum*)* and historical to rare. *D. wrightianum* is known from a few vernal ponds in Maurice River Township (Moore 8841).

216. Change name: *Dichanthelium commutatum* to *D. commutatum* var. *ashei*.

217. Add: *Dichanthelium cryptanthum*, historical. This species was historically reported from the county in Upper Deerfield Twp. along an edge of an open meadow (Bayard Long 34755, 1930, PH). In the original checklist, it was treated as a synonym of *D. scabriusculum*; similarly Snyder (2013; pers. comm.) treats *D. cryptanthum* as a synonym of *Panicum scabriusculum*.

218. Change name: *Dichanthelium dichotomum* var. *ensifolium* to *D. ensifolium*.

219. Change name: *Dichanthelium dichotomum* var. *tenue* to *D. tenue* (\equiv *Panicum tenue*)*.

220. Add: *Dichanthelium leucothrix* (\equiv *Panicum leucothrix*)*, historical. In the original checklist, *D. leucothrix* was included within a broadly circumscribed *D. acuminatum* var. *implicatum*; this rare species was historically known from the county in vernal ponds near Milmay in Maurice River Twp. (Frank Hirst 79, 30 Aug. 1959, PH) and near Bennetts Mill in Vineland (Bayard Long 38721, 2 Aug. 1932, PH).

221. Add: *Dichanthelium lucidum*, occasional. In the original checklist this species was included within a broadly circumscribed *D. dichotomum* var. *dichotomum*. This species is occasionally encountered in acidic boggy wetlands, chiefly in the eastern part of the county (Moore 9993, 10404).

222. Add: *Dichanthelium mattamuskeetense*, occasional. In the original checklist, this species was included within a broadly circumscribed *D. dichotomum* var. *dichotomum*. This species is limited to open acidic boggy wetlands in the eastern portion of the county (Moore 6132).

223. Add: *Dichanthelium meridionale*, frequent. In the original checklist, *D. meridionale* was included within a broadly circumscribed *D. acuminatum* var. *implicatum*; it is frequently encountered in dry sandy habitats (Moore 4725).

224. Add: *Dichanthelium microcarpon*, frequent. In the original checklist this species was included within a broadly circumscribed *D. dichotomum* var. *dichotomum*. This species is frequently encountered in shaded wetlands throughout the county (Moore 10406, 10480).

225. Change name: *Dichanthelium sabulorum* var. *thinium* to *D. columbianum*.

226. Change name: *Dichanthelium sphaerocarpon* var. *isophyllum* to *D. sphaerocarpon*.

227. Add: [*Digitaria ciliaris*], occasional. This crabgrass, native to the Old World (Chen and Phillips 2006), is occasionally encountered in the county. Chen and Phillips (2006: 543) reported *D. ciliaris* to be “at the center of a complex of similar and somewhat intergrading weedy species including *D. bicornis*, *D. cruciata*, *D. henryi*, *D. radicata*, *D. sanguinalis* and *D. setigera*. Occasionally intermediate specimens will be found that are difficult to place.” Mike Feder (pers. comm.) reports that *D. ciliaris* is common in Queens Co., New York, and some material appears intermediate with *D. sanguinalis*.

228. Change status: *Digitaria filiformis* from frequent to unknown. Though historical records exist for this naive crabgrass at PH, there are no recent records. Further research is needed to clarify the species’ status in the county.

229, 230. Change name and status: *Diplachne maritima* to *Leptochloa fascicularis* var. *maritima** and historical to rare. This species was recently observed in an open wet tidal wetland SW of Port Norris in Commercial Twp. (Brecht and Moore 2011, Moore 2015; Moore 10555).

231. Add: [*Echinochloa crus-pavonis* var. *crus-pavonis*], rare. This taxon is known from one site in an open, tidal marsh in a tidal pond along the Manantico Creek in eastern Millville (Moore 10566, 10567), the only reported location from New Jersey. The material at this site has drooping inflorescences and lower paleas more than ½ as long as the lemmas, and thus is readily identifiable as the typical variety, and not *E. crus-pavonis* var. *macera* (the epithet is sometimes spelled as “*macra*”; see Barkworth et al. 2007: 792). Michael (2003: 398) reported the native range of the species as occurring from “British Columbia to Arizona, east to Florida, and south into South America.” Michael (2003: 398) reported the typical variety to be “the more southern of the two varieties, extending through Mexico and the Caribbean to Bolivia and Argentina...and presumably as an adventive species as far north as Humboldt County, California.” Michael (2003: 398) had *E. crus-pavonis* var. *macera* “extending south only as far as northern Mexico.” Given the native range reported for *Echinochloa crus-pavonis* var. *pavonis*, it is best taken as an adventive in New Jersey.

232. Add: [*Eragrostis curvula*]†, occasional. This species, native to Africa (Peterson 2003), is occasionally encountered in open sandy areas (Moore 7340, 9523, 9525, 9526). In the early 1980, the species, as part of a project entitled, “Shore Meadows: New Jersey’s Beautiful—Naturally!,” was deliberately planted in the county by the New Jersey State Department of Transportation along State Route 55 in an effort to curtail soil erosion and improve “roadside aesthetics” (Berzok 1998, Nichnadowicz, 2001).

233. Add: *Eragrostis hirsuta , rare.** This state-endangered species was recently discovered in the county and state by David Snyder (pers. comm.). Large populations were later observed at two other locations, one in southern Millville NE of Laurel Lake in an open sandy area adjacent to a Virginia pine (*Pinus virginiana*) forest (Moore 10382) and the other in opens sandy areas W of the Manantico Creek along the railroad right-of-way (Moore 11856). The species' tall panicles (sometimes over 8 dm. at maturity) readily distinguishes it from New Jersey's other *Eragrostis* species.

234. Change name: [*Festuca elatior*] to [*Festuca arundinacea*]†. The Linnaean name *Festuca arundinacea* has been formally rejected due to problems with its typification and the correct name for this species is now *F. arundinacea* Schreb. (Reveal and Terrell 1991). More recently this species and the closely related *F. gigantea* (L.) Vill. and *F. pratensis* Schreb. have been transferred out of *Festuca* into their own genus, *Schedonorus* P. Beauv. (Darbyshire 2007), or into *Lolium* L. (Darbyshire 1993).

235. Add: [*Hordeum murinum*], occasional. This species is native to Eurasia (Humphries 1980) and is an established weed in western North America, including Canada, Mexico and the U.S., with scattered reports in the eastern United States (Hitchcock 1917, Bothmer et al. 2007). This species has recently been observed in dry, open, disturbed areas in Millville and W of Mauricetown in Commercial Twp (Moore 10562). All three subspecies native to the Old World (*H. murinum* subsp. *glaucum* (Steud.) Tzvelev, *H. murinum* subsp. *leporinum* (Link) Arcang., *H. murinum* L. subsp. *murinum*) have been reported as introduced in North America (Humphries 1980, Bothmer et al. 2007). Further research is needed on the material in the eastern U.S. regarding its infraspecific assignment.

236. Add: [*Microstegium vimineum*]†, common. Since the publication of the original checklist, this species, native to the Old World (Bien et al. 2008), has spread throughout much of the county, being more common in the richer soils of the western part of the county, but also frequently encountered in disturbed areas in the eastern Pinelands regions of the county (Moore 6692, 7635).

237. Add: [*Miscanthus sinensis*]†, rare. This species, native to Asia (Chen and Renvoize 2006) and widely planted in the U.S. as an ornamental and occasionally escaped (Barkworth 2003c), has been observed in Vineland and in Back Neck in Fairfield Twp (Moore 7691). Unlike some populations observed in Long Island (Glenn and Moore 2010), the populations observed in Cumberland County are not large and do not appear to be spreading.

238. Change status: *Muhlenbergia torreyana from historical to rare.** This rare species, historically reported from a few intermittent ponds in eastern Vineland (John Fogg Jr. 5280, 2 Oct. 1932; Frank Hirst 64, 14 Oct. 1962; Robert Hirst s.n., 14 Oct. 1962; Bayard Long 19431, 28 Sep. 1918, PH), is also currently known from two intermittent ponds in eastern Maurice River Twp. (Moore 10578).

239. Add: *Panicum amarum* var. *amarum*, rare. Whereas, *P. amarum* var. *amarulum* is known from the county, this variety has not historically been reported. It was recently

observed along the main entrance road of the Menantico Ponds Wildlife Management Area in an open sandy area (*Moore 11882*). This population was likely recently established. The species has recently been observed in cultivation in Millville.

240. Change status: *Paspalum dissectum** from historical to rare. This species, historically known from N of Heislerville in Commercial Twp. (*Frank Hirst 93*, 24 Sep. 1961, PH), was recently observed in an intermittent pond near Main Rd. Station in Vineland (Scagnelli and Moore 2009).

241. Change status: *Paspalum setaceum* var. *ciliatifolium** from frequent to rare.

242. Change status: *Paspalum setaceum* var. *psammophilum** from occasional to rare.

The following three varieties of *Paspalum setaceum* have been reported from Cumberland County: *P. setaceum* var. *ciliatifolium* (Michx.) Vasey, *P. setaceum* var. *psammophilum* (Nash) D.J. Banks and *P. setaceum* Michx. var. *setaceum*. The three varieties are found in dry, sandy soils, usually in open habitats. Further examination of material has shown the bulk of the material in the county being referable to *P. setaceum* var. *setaceum*, with *P. setaceum* var. *ciliatifolium* and *P. setaceum* var. *psammophilum* being rare. *P. setaceum* var. *muhlenbergii* (Nash) D.J. Banks has not been reported from the county but should be sought.

243, 244. Change name and status: *Phragmites australis* to *Phragmites australis* subsp. *australis*† and native to non-native. Recent systematic research has concluded that this species in North America consists of native and nonnative lineages, these lineages in New Jersey known as *P. australis* subsp. *americanus* and *P. australis* (Cav.) Trin. subsp. *australis* Saltonst., P.M. Petersen & Soreng, respectively (Saltonstall et al. 2004). The non-native material in the U.S. is from the Old World (Saltonstall 2002). A review of historical collections, recent collections, and examination of material in the field in the county, has not resulted in the identification of any native material, all material representing *P. australis* subsp. *australis*. See Saltonstall et al. (2005) for an overview on how to distinguish the native and non-native material.

245. Add: [*Phyllostachys* sp.], rare. Escaped material of this bamboo genus has been observed and collected from Millville, E of Port Elizabeth in Maurice River Twp. and Vineland. Identification of material to species is difficult, since all material observed has been sterile. All the material observed has been morphologically uniform and possesses vegetative characters suggestive of *Phyllostachys aureosulcata* McClure, such as the distinctive yellow-green color of the culm groove (hence the epithet *aureosulcata*) and unribbed, scabrous internodes (McClure 1957). Other genera of bamboos that have been reported to escape in the area, such as *Arundinaria* Michx., *Bambusa* Schreb. and *Pseudosasa* Makino ex Nakai, have not been observed as escapes in the county but should be sought.

246. Add: [*Poa bulbosa*], occasional. Native to Eurasia (Edmonson 1980), known from several open, dry sandy sites in the county (*Moore 9862*), all of the material observed being viviparous.

247. Add: [*Poa compressa*], frequent. Inadvertently left off the original list.

248. Change status: *Puccinellia fasciculata from historical to rare.** This species was historically reported from West Creek in Maurice River Twp. (*John Fogg Jr. 5620*, 1933, PH), Sayres Neck in Fairfield Twp. (*Bayard Long 43171*, 1934, PH) and Sea Breeze in Fairfield Twp. (*Bayard Long 40046*, 1933). Recently, it was observed at Moores Beach in Maurice River Twp. (*Moore 5160*). Although historically treated as native in the eastern U.S., (Fernald 1950; Gleason and Cronquist 1963, 1991), Davis and Consaul (2007: 463) regard all occurrences of this species in North America, as “probably the result of human introductions.” If it was introduced in the eastern U.S., the introduction was quite early, the species being reported by Britton (1889; as *Glyceria distans*), Stone (1911) and Taylor (1915). Britton’s 1881 records of *G. distans* (\equiv *P. distans*) from ballast in Camden and Hudson Cos. likely represent the Eurasian species, now known as *P. distans*. Keller and Brown’s (1905: 53) report of *P. distans* from “along coast and ballast” likely represents *P. fasciculata* (coastal records) and *P. distans* (ballast records). The species was originally described by Torrey (1823) as *Poa fasciculata* (later transferred into *Puccinellia* by Bicknell 1908) based on material from New York. The species is native to Europe (Hughes and Halliday 1980).

249. Add: [*Setaria faberi*], frequent. Inadvertently left off the original list.

250. Add: [*Setaria geniculata*], frequent. Inadvertently left off the original list.

251. Change status: *Setaria magna from historical to rare.** This rare species was historically known from tidal wetlands in Greenwich (*Bayard Long 47971*, 10 Nov. 1935, PH), Moores Beach in Maurice River Twp. (*Bayard Long 5580*, 29 Dec. 1940, PH) and Newport Landing in Downe Twp. (*Bayard Long 45353*, 18 Nov. 1934; *47992*, 1 Dec. 1935, PH). Recently, it has been reported from the Port Norris area at a few sites (*Moore 2004b*, 2015; Brecht and Moore 2011; *Moore 9921*, *Goldman 2265*, BH).

252. Add: [*Sorghum vulgare*], rare. Inadvertently left off the original list.

253. Change name: *Sporobolus asper* var. *asper* to *Sporobolus compositus* var. *compositus.**

This taxon has previously been known as *Sporobolus asper* var. *asper*. However, even though *S. asper* (P. Beauv) Kunth (Révis. Gramin. 1: 68. 1829) is earlier than *S. compositus* (Poir.) Merr. (in Circ. Div. Agrostol. U.S.D.A. 35: 6. 1901), *S. compositus* is the correct name when the two are treated as synonyms, its basionym *Agrsotis compositus* Poir. (Encycl. 1: 254. 1801) predating *Vilfa aspera* P. Beauv. (Ess. Agrostogr.: 16, 147, 181. 1812), the legitimate basionym of *S. aspera*, *Agrostis aspera* Michx. (Fl. Bor.-Amer.: 152. 1803) being an illegitimate later homonym of *Agrostis aspera* Weber (Suppl. Fl. Holsat.: 6: 4. 1787).

254. Add: [*Tragus racemosus*], rare. This curious species, native to Europe (Tutin 1980), is known from open dry sandy areas along the railroad from the Millville Industrial Park to Manumuskin Station (Brecht and Moore 2013b, *Moore 8943*).

255. Add: *Triplasis purpurea*, occasional. Occasionally encountered in open, sandy habitats in the eastern part of the county (*Moore 8944*), and in similar habitats near the dune and beach systems along the bayshore (*Moore 11362*). Specimens at PH: *B. Long 49472*, 13 Dec. 1936, Manantico along railroad; *B. Long 51477*, 4 Sep. 1937, W of Vineland.

Polygalaceae

256. Add: *Polygala curtissii, rare.** This state-endangered species was discovered in the county by the first author in Rosenhayn in Deerfield Twp. in 2004 (*Moore* 6742). The population represents the only known site for this species in New Jersey and occurs in an open, sandy area along the railroad; it was still extant in 2013 (Lorimer and Moore 2015b). Gleason and Cronquist (1991) cited Delaware as the northern limit of the species' range, the species was discovered in the 1980s from Chester Co., Pennsylvania.

257. Change status: *Polygala polygama from historical to rare.** This rare species, which was historically known from a number of sites in Fairfield Twp., Maurice River Twp., Upper Deerfield Twp. and Vineland, has more recently been discovered by Stephen Field at two locations in Vineland, one of which has been destroyed by development (*Moore* 1995).

Polygonaceae

258. Change status: [*Polygonum caespitosum* var. *longisetum*][†] (*≡Persicaria longiseta*), from occasional to common. This taxon is common throughout the county in disturbed areas (*Moore* 6685, 7636, 7674).

259. Change status: *Polygonum careyi* (*≡Persicaria careyi*) from occasional to historical. There is only one confirmed record for this species from the county: *B. Long* 46968, 30 Jul. 1935, 2 mi. ENE of Bennetts Mill.

260. Add [*Polygonum extremiorientale*] (*≡Persicaria extremiorientalis*), rare. Native to Asia, recently reported as introduced the eastern in U.S. (Atha et al. 2010). Close to *P. lapathifolium* and *P. maculosum*, distinguished by its pilose stems, long leaf margin setae (to 1.1 mm.), stipitate glandular peduncles and long nodding racemes (to 8 cm.) (Atha et al. 2010).

261. Add: [*Polygonum hydropiper*] (*≡Persicaria hydropiper*), rare. This species, native to Europe (Webb et al. 1993b), was collected at one site in southern Millville, in an open, moist disturbed roadside in Laurel Lake in Millville (*Moore* 9536). The species may be more frequent, its general appearance being close to the common *Polygonum punctatum*.

262. Add: [*Polygonum perfoliatum*][†] (*≡Persicaria perfoliata*), rare. A few populations of this invasive species, native to Asia (A.-J. Li et al. 2003), have been found in open, disturbed freshwater tidal wetlands along the Maurice River in Millville (Moore and Brecht 2013; *Moore* 9618).

263. Change status: *Polygonum prolificum* (*≡P. ramosissimum* subsp. *prolificum*) from historical to rare. This taxon has recently been observed at Matts Landing (*Moore* 5128a) Moores Beach (*Moore* 2004b; *Moore* 5141, 5142, 5204, 5211) and Thompsons Beach (*Moore* 5192, 5215).

264. Add: *Polygonum punctatum* (*≡Persicaria punctata*), common. This species, common in open wetlands, including freshwater tidal marshes (Ferren and Schuyler 1980), was inadvertently left off the original checklist. The species is variable and rhizomatous perennials with trigonous achenes (*P. punctatum* Elliott var. *punctatum*; *Moore* 5582) and

taprooted annuals with lenticular achenes (*P. punctatum* var. *confertiflorum* (Meisn.) Fassett; Moore 6702a, 5587) have been observed in the county, sometimes growing together.

265. Add: *Polygonum robustius* (\equiv *Persicaria robustior*), rare. Inadvertently left off the original list.

266. Add: [*Polygonum sachalinense*] (\equiv *Fallopia sachalinensis*; *Reynoutria sachalinensis*)†, rare. Inadvertently left off the original list.

267. Add: *Polygonum sagittatum* (\equiv *Persicaria sagittata*), frequent. Inadvertently left off the original list.

Pontederiaceae

268. Add: [*Eichornia crassipes*], rare. Native to the tropical Americas (Gleason and Cronquist 1991), this species has been observed in Cumberland Pond in Maurice River Twp. and along the Berrymans Branch of the Manantico Creek in Vineland (Moore 9624). The species is an aquarium plant and it is possible the material at these sites represented material that was dumped from an aquarium. However, in both cases the species was observed over more than one growing season. The site along the Berrymans Branch was in a swamp also a few hundred yards away from any road.

Portulacaceae

269. Add: *Portulaca oleracea*, common. Inadvertently left off the original list, this common weed, native to the Old World (Walters 1993b, Lu and Gilbert 2003) and probably also native to the New World (Byrne and McAndrews 1975), is found in open disturbed areas (Moore 5493).

Primulaceae

270. Add: [*Lysimachia clethroides*], rare. Native to Asia (Hu and Kelso 1996), one population of this species was discovered in a recently burned pine forest in Commercial Twp. N of Payntors Corner.

Ranunculaceae

271. Add: [*Clematis terniflora*]†, common. This species, native to Asia (Wang and Bartholomew 2001), is frequent in disturbed, open areas. The species is superficially similar to the native *Clematis virginiana*, with which it was confused during the preparation of the original checklist.

272. Change status: *Clematis virginiana*, from common to undetermined. In the preparation of the original checklist, material of the preceding was misidentified as this native species. Whereas historical collections are at PH (mostly from Deerfield, Finley, SE of Jericho), no recent populations have been observed and further fieldwork is needed to better understand its status in the county.

273. Add: [*Ranunculus ficaria*]†, occasional. This species, native to Europe (Tutin and Akeroyd 1993b), has been recorded in mesic to wet woodlands at a few sites in the Matapeake-Chillum-Mattapex soil association (Powley 1978) in the northwest area of the

county (*Moore 10661*). This species can be highly invasive often forming thick mats on the forest floor (*Moore 2008*).

274. Change status: [*Ranunculus sarduous*] from historical to rare. Native to Europe (Tutin and Akeroyd 1993b) collected in an agricultural field near Cedarville in Lawrence Twp. (*Moore 5971*).

Rosaceae

275. Add: *Amelanchier laevis*, rare. Inadvertently left off the original list.

276. Add: [*Duchesnea indica*]†, occasional. Native to Asia (C.-L. Li et al. 2003), is occasionally found in moist disturbed areas in the county (*Moore 7015*).

277. Change name: *Malus angustifolia* to *Malus angustifolia* var. *puberula**. All material of this rare species from southern New Jersey is referable to this variety.

278. Add: [*Poterium sanguisorba*] (≡*Sanguisorba minor*). Native to Eurasia and northern Africa (Weakley 2014), one population was recently discovered in gravelly open areas at the top of Pine Mount in Greenwich Twp.

279. Add: [*Pyrus calleryana*]†, occasional. Native to Asia (Gu and Spongberg 2003) and widely planted, this pear is occasionally encountered as an escape in disturbed, open areas, such as field and roadsides.

280. Add: [*Rubus bifrons*], historical. This species, native to Europe (Hesslop-Harrison 1968), was historically reported from the county by Bayard Long (specimen at PH).

281. Add: *Rubus pascuus*, rare. This species has been observed in disturbed areas in Menantico Ponds Wildlife Management Area (*Moore 5391, 6798, 6804*) and in Back Neck in Fairfield Twp. Alice et al. (2014) have suggested that *R. pascuus* may represent a stabilized hybrid between a North American species and an introduced European species.

282. Add: [*Rubus phoenicolasius*]†, rare. This species, native to Asia (Lu and Boufford 2003), has been observed in disturbed open areas and roadsides in Mauricetown in Commercial Twp. (*Moore 9993*) and Millville (*Moore 10010*).

283. Add: [*Spiraea prunifolia*], occasional. Inadvertently left off the original list.

Rubiaceae

284. Add: [*Cruciata pedemontana*] (≡*Galium pedemontanum*), rare. This species, native to Europe, (Ehrendorfer 1976) was collected in eastern Millville in open, disturbed sandy roadside adjacent to an oak-pine woodland (*Moore 5304*). This collection represented the first record of this species for New Jersey.

285. Add: *Diodia virginiana* var. *virginiana**, rare. This state-endangered species was discovered in the County by Brett Roberts in 2012 near East Point. The species was observed in the area in 2014 by the first author. It was occasional in open dampish roadsides (*Moore 12239*).

286. Change status: [*Galium mollugo*] from historical to rare. This species, native to Europe (Ehrendorfer and Krendl 1976), was collected in eastern Vineland in a wet open area adjacent to a farm field (*Moore 11434*).

287. Add: *Houstonia pusilla* (= *Hedyotis crassifolia*), rare. This species was recently collected at a couple of sites in eastern Millville (*Moore 10884*). It occurred in open, dry, sandy areas. Gleason and Cronquist (1991) reported the northern limit of this species' range as southeastern Virginia. However, Knapp et al. (2011) and Greller and Herth (2011) recently reported this species from Delaware and Maryland and Long Island, respectively. Given this and the recent New Jersey records—the species has also been observed in Cape May Co., New Jersey (David Snyder, pers. comm.)—it would seem that this species has recently spread northward.

Rutaceae

288. Add: [*Dictamnus albus*], rare. Native to northern Africa, Asia and southern Europe (Townsend 1968, Zhang and Hartley 2008), an escaped population was found along an open roadside and field edge east of Loes Mill. Brett Roberts has also observed this species elsewhere in the county.

Salicaceae

289. Add: *Populus deltoides*, rare. Observed in a rich woodland near Davis Mill in Stow Creek Twp. (*Moore 2006*; *Moore 6736*) and in a sandy area NW of Manumuskin Station.

290. Add: [*Salix cinerea*], rare. This willow, native to Europe (Rechinger and Akeroyd 1993), has been observed at two locations in eastern Vineland (*Moore 10934*, *10940*). In the New York City metropolitan area, this species has been shown to be quite invasive (Glenn 2008).

291. Add: *Salix tristis* (≡ *S. humilis* var. *tristis*; = *S. humilis* var. *microphylla*), rare. Inadvertently left off the original list.

Saururaceae

292. Change status: *Saururus cernuus* from historical to rare. This species has been observed by the third author at Sunset Lake in Bridgeton.

Scrophulariaceae

293. Add: [*Digitalis purpurea*], rare. Native to Europe (Heywood 1972) and commonly planted, this species was found growing clearly outside of cultivation in a Virginia pine forest in southern Millville (*Moore 9338*).

294. Change status: *Gratiola pilosa** from historical to rare. This state-rare species was recently observed in a moist open field W of Centre Grove in Lawrence Twp. and along a moist roadside in Haleyville.

295. Add: [*Verbascum phlomoides*], rare. This species, native to Europe (Ferguson 1972), was collected near the RR at Manumuskin Station (*Moore 9525*).

Smilacaceae

296. Change status: *Smilax laurifolia** from historical to rare. This rare species has been observed in Atlantic white cedar swamps NW of Hunters Mill in Maurice River Twp. (Moore 2004c) and in Vineland near the Sherman Ave. bog site (Lorimer and Moore 2015b) (Moore 11359).

297. Add: *Smilax walteri*, rare. This species has recently been observed in open swampy areas E of Leesburg in Maurice River Twp. (Moore 5645) and NE of Loes Mill in Commercial Twp. (Moore 10679). Also, reported from the county in Vineland by Keller and Brown (1905) on the authority of Millie Abbott from Vineland (record repeated in Stone 1911 and Briggs 1930); however, no specimens is known for this historical record.

Sparganiaceae

298. Delete: *Sparganium androcladum*. All collections of *Sparganium* from the county have been reviewed and are properly identified as *Sparganium americanum*. The only true *S. androcladum* material at PH from southern New Jersey was collected in Cold Spring, Cape May. Co. Stone (1911) misapplied the name *Sparganium americanum androcladum* to material of *S. americanum* with branched inflorescences.

Valerianaceae

299. Add: *Valerianella radiata**, rare. This state-endangered species was discovered at one site N of North Port Norris along a moist roadside (Snyder 2000; Moore 4201).

Verbenaceae

300. Add: [*Vitex agnus-castus*], rare. Native to Europe (Tutin 1972), this species has been noted along a roadside near the Main Avenue Station in northeastern Vineland (Scagnelli and Moore 2009; Moore 7431)

Vitaceae

301. Add: [*Ampelopsis brevipedunculata*]† (≡*A. glandulosa* var. *brevipedunculata*), rare. This invasive species, native to Asia (Chen and Wen 2007), was observed at two locations in Deerfield in Upper Deerfield Twp. (Moore, 11255) and in Vineland (Moore 10222).

Xyridaceae

302. Add: *Xyris jupicai**, rare. This species is known from wet sandy wetlands in borrow pits in southeastern Millville (Moore 5548) and NE of Dorchester in Maurice River Twp.

DISCUSSION

The original list (Moore 1989) reported the occurrence of 1340 species (37 pteridophytes, 10 gymnosperms, 1293 angiosperms), of which 1019 were native and 321 were non-native. This report documents 302 changes—202 additions (82 native species, 116 non-native species, 4 hybrids), 11 deletions, 67 status changes, 22 name changes—to the original list. The total number of species now reported from the county is 1531, 1094 of which are native and 437 are non-native. Regarding rare taxa (Table 2), 205 have been reported, 34 of these new to the county (i.e., not included on the original list) and another 23 originally reported

as historical now known to be extant. Regarding invasive species (Table 3), 93 are reported as invasive or potentially invasive in New Jersey (Category 1 or Category 2), Delaware, New York, or Pennsylvania, with 33 of these species being new to the county.

A spreadsheet of the list of plants for the county with details in rarity and invasive status is available upon request from the first author. This spreadsheet also reports on discrepancies between this list and occurrence records for Cumberland Co. in Britton (1881, 1889), Briggs (1930), Hough (1983), Keller and Brown (1905), Stone (1911) and Taylor (1915). Building off the list prepared by Briggs (1930: 94–115), a separate spreadsheet has been prepared of all plant taxa not reported in the literature (Britton 1881, 1889, Briggs 1930, Hough 1983, Keller and Brown 1905, Stone 1911, Taylor 1915) for Cumberland Co. but known from adjacent counties (i.e., Atlantic, Cape May, Gloucester, Salem).

Table 1. Species reported from Cumberland Co. based on literature but for which no specimens are known. Species with an asterisk (*) are tracked by the New Jersey Natural Heritage Program (Snyder 2013).

| |
|--|
| 01. <i>Angelica atropurpurea</i> . Reported from the county by Hough (1983). The only specimen found (A, BH, BKL, CHRB, GH, NEBC, NY, PH, US were searched) for Cumberland Co. identified as this species is at PH (<i>G. Scarborough s.n.</i> , 19 Aug. 1879, Vineland). However, the material on the sheet is clearly <i>Angelica venenosa</i> , the fruits being exceptionally puberulent. |
| 02. <i>Aralia spinosa</i> . Reported from the county by Hough (1983). All records of this species for the county have proven to be <i>A. elata</i> (see Moore et al. 2009; also see discussion in text for <i>A. elata</i>). |
| 03. <i>Aster radula</i> * (≡ <i>Eurybia radula</i> (Aiton) Nesom). Reported from the county by Hough (1983). However, no material from Cumberland Co. was found at A, BH, BKL, CHRB, GH, NEBC, NY, PH or US. |
| 04. <i>Carex bromoides</i> . Reported from the county at Manumuskin by Keller and Brown (1905) on the authority of Ulsema C. Smith. No material from Cumberland Co. was found at A, BH, BKL, CHRB, GH, NEBC, NY, PH or US. Also not reported from Cumberland County by Naczi (1990). |
| 05. <i>Cassia hebecarpa</i> . Reported from the county by Hough (1983). However, no material from Cumberland Co. was found at A, BH, BKL, CHRB, GH, NEBC, NY, PH or US, although material was present for all four bordering counties (Atlantic, Cape May, Gloucester, Salem). |
| 06. <i>Diervilla lonicera</i> . Reported from the county by Keller and Brown (1905), Stone (1911) and Hough (1983). However, no material from Cumberland Co. was found at A, BH, BKL, CHRB, GH, NEBC, NY, PH or US. See discussion in text. |
| 07. <i>Draba reptans</i> *. Reported from the county in Vineland by Keller and Brown (1905) on the authority of Millie Abbott from Vineland. This record is the basis for the species being reported from Cumberland County in Stone (1911), Briggs (1930) and Hough (1983). However, no material from Cumberland Co. was found at A, BH, BKL, CHRB, GH, NEBC, NY, PH or US. |
| 08. <i>Euphorbia peplus</i> . This non-native was reported from the county by Hough (1983) based on a site record. No material from Cumberland Co. was found at A, BH, BKL, CHRB, GH, NEBC, NY, PH or US. |
| 09. <i>Geranium robertianum</i> . Reported from the county in Vineland by Keller and Brown (1905) on the authority of Millie Abbott from Vineland. However, Stone (1911: 515 fn.) stated that Abbott’s record “was almost certainly one of the introduced species common in that vicinity.” No material from Cumberland Co. was found at A, BH, BKL, CHRB, GH, NEBC, NY, PH or US. |
| 10. <i>Hottonia inflata</i> *. Reported from the county by Hough (1983). However, no material from Cumberland Co. was found at A, BH, BKL, CHRB, GH, NEBC, NY, PH or US. |
| 11. <i>Lactuca floridana</i> . Reported from the county by Hough (1983). At PH, there is the following specimen in the <i>L. floridana</i> folder: <i>B. Long</i> 40362, 4 Jul. 1933, Springtown. There are two penciled annotations: “ <i>L. florida</i> ” [sic]; “? cf. <i>L. florida</i> ” [sic]. The material is sterile consisting only of leaves; it is not identifiable to species. |

12. *Lobelia dortmana**. Reported for Cumberland Co. by Hough (1983). However, no material from Cumberland Co. was found at A, BH, BKL, CHRB, GH, NEBC, NY, PH or US.
13. *Mentha ×rotundifolia*. This non-native was reported from the county by Hough (1983). No material from Cumberland Co. was found at A, BH, BKL, CHRB, GH, NEBC, NY, PH or US.
14. *Nymphoides aquatica* Reported from Cumberland Co. by Britton (1889), Stone (1911), Briggs (1930) and Hough (1983). The basis for the record — the only record of this species for New Jersey — is material collected from Sunset Lake in Bridgeton and Upper Deerfield Twp. by A.C. Apgar in 1886 (Bayard Long later collected material from there). This material has since been determined to be robust material of *N. cordata* as reported in the original checklist (Moore 1989: 34 fn.1).
15. *Quercus imbricaria**. Reported from the county by Hough (1983). No material from Cumberland Co. was found at A, BH, BKL, CHRB, GH, NEBC, NY, or US. See discussion in text.
16. *Rhododendron roseum*. Reported from the county by Hough (1983). No material from Cumberland Co. was found at A, BH, BKL, CHRB, GH, NEBC, NY, or US.
17. *Rhynchospora glomerata** Reported from the county by Hough (1983). No material from Cumberland Co. was found at A, BH, BKL, CHRB, GH, NEBC, NY, or US. Stone (1911) misapplied the name *R. glomerata* for material that is properly known as *R. capitellata*.
18. *Sagittaria montevidensis* (= *S. calycina*)*. Reported from the county by Hough (1983). No material from Cumberland Co. was found at A, BH, BKL, CHRB, GH, NEBC, NY, or US.
19. *Solidago arguta* var. *boottii* (≡ *Solidago boottii*). Reported from the county by Hough (1983). No material from Cumberland Co. was found at A, BH, BKL, CHRB, GH, NEBC, NY, or US. All material identified as this represents *S. tarda*. See discussion in text.
20. *Sparganium androcladum*. Reported from the county by Stone (1911), the result of Stone’s misapplication of the name. See discussion in text.
21. *Tradescantia ohiensis**. Reported from the county by Hough (1983). No material from Cumberland Co. was found at A, BH, BKL, CHRB, GH, NEBC, NY, or US.
22. *Xyris caroliniana** (= *X. flexuosa*). Reported from the county at Beaver Dam, Dividing Creek by Briggs (1930) as *X. flexuosa*, with no specimen cited. *Xyris caroliniana* is only known from the central Pine Barrens outside of Cumberland Co. and this record is likely based on a misidentification, possibly of *X. smalliana*, which was not reported by Briggs (1930) but is known from the county.
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Table 2. Rare taxa (205) reported from Cumberland County, New Jersey tracked by the New Jersey Natural Heritage Program (Snyder 2013). The 65 taxa with a double dagger (‡) are only historically known from the county. The 34 taxa with a plus sign (+) were not included in the original list but are newly reported here. The 23 taxa with an exclamation point (!) were reported as historical in the original list (Moore 1989) but are now known to be extant in the county. The shorthand used in the rarity status column is that used by the New Jersey Natural Heritage Program (2013). The rare taxa *Bouteloua curtipendula* (G5T5, S1, E), *Cercis canadensis* var. *canadensis* (G5T5, S1, E), *Monarda didyma* (G5, S2), *Pinus resinosa* (G5, S1.1, E) and *Prunus angustifolia* var. *angustifolia* (G5T4T5, S2) have been reported from the county, the first, second and fourth newly reported here, but are not included in the table because the reported populations from the county are not native or are not confirmed to be native. The state-endangered *Quercus imbricaria* (G5, S1.1, E) was reported as historical on the original list; it is deleted here, its original inclusion based on misidentified material (see discussion in text). Seven species (*Calamovilfa brevipilis*, *Carex barrattii*, *Liparis liliifolia*, *L. loeselii*, *Phoradendron leucarpum*, *Scleria minor*, *S. reticularis*) not included in Snyder (2013) but listed by the New Jersey Pinelands Commission (NJAC 7:50-6.27(a)) as threatened or endangered in the Pinelands (see Caiazza and Fairbrothers 1980) are also included in the Table (“LP” is given in the rarity column).

| Taxon | Rarity Status |
|--|---------------------|
| 001. <i>Aeschynomene virginica</i> | G2, S1, LT, E, LP |
| 002. <i>Agastache nepetoides</i> ‡ | G5, S2 |
| 003. <i>Agatache scrophulariifolia</i> ‡ | G4, S2 |
| 004. <i>Alopecurus carolinianus</i> + | G5, S2 |
| 005. <i>Amelanchier stolonifera</i> | G5, S3 |
| 006. <i>Amianthium muscitoxicum</i> ! | G4G5, S2 |
| 007. <i>Andropogon gyrans</i> (= <i>A. elliotii</i> nom. illeg.) | G5, S2 |
| 008. <i>Angelica venenosa</i> ‡ | G5, S1S2 |
| 009. <i>Arethusa bulbosa</i> | G4, S2 |
| 010. <i>Aristida dichotoma</i> var. <i>curtissii</i> + | G5T5, S3 |
| 011. <i>Aristida virgata</i> ‡ | G5T4T5, S2 |
| 012. <i>Aristolochia serpentaria</i> ‡ | G4, S3 |
| 013. <i>Artemisia campestris</i> subsp. <i>caudata</i> | G5T5, S2 |
| 014. <i>Asclepias lanceolata</i> + | G5, S2 |
| 015. <i>Asclepias rubra</i> ‡ | G4G5, S2 |
| 016. <i>Asclepias variegata</i> ! | G5, S1 |
| 017. <i>Asclepias verticillata</i> ‡ | G5, S2 |
| 018. <i>Aster concolor</i> | G5, S2, LP |
| 019. <i>Bidens bidentoides</i> | G3G4, S2 |
| 020. <i>Bidens mitis</i> + | G4?, S1, E, LP |
| 021. <i>Boltonia asteroides</i> var. <i>glastifolia</i> ! | G5TNR, S1, E, LP |
| 022. <i>Calamovilfa brevipilis</i> ! | LP |
| 023. <i>Callitriche terrestris</i> + | G5, S3 |
| 024. <i>Calystegia spithamea</i> subsp. <i>spithamea</i> ‡ | G4G5T4T5, S1, E, LP |
| 025. <i>Carex aggregata</i> + | G5, S1S2 |
| 026. <i>Carex barrattii</i> | LP |
| 027. <i>Carex mitchelliana</i> ‡ | G4, S2 |
| 028. <i>Carex silicea</i> | G5, S3 |
| 029. <i>Carex typhina</i> | G5, S3 |
| 030. <i>Carex utriculata</i> (≡ <i>C. rostrata</i> var. <i>utriculata</i>)‡ | G5, S2 |
| 031. <i>Chasmanthium latifolium</i> + | G5, S1 |
| 032. <i>Chenopodium pratericola</i> | G5, S2 |
| 033. <i>Chionanthus virginicus</i> | G5, S3 |
| 034. <i>Clitoria mariana</i> | G5, S1, E, LP |
| 035. <i>Crataegus pedicellata</i> | G5, S1S2 |
| 036. <i>Croton wildenowii</i> (≡ <i>Crotonopsis elliptica</i> , <i>Crotonopsis michauxii</i> var. <i>ellipticus</i>)! | G5, S2, LP |
| 037. <i>Cuscuta coryli</i> ! | G5?, S2 |
| 038. <i>Cuscuta polygonorum</i> + | G5, S2 |

| Taxon | Rarity Status |
|--|---------------------|
| 039. <i>Cyperus engelmannii</i> | G4Q, S2 |
| 040. <i>Cyperus polystachyos</i> var. <i>texensis</i> ‡ | G5T5, S1, E, LP |
| 041. <i>Cyperus pseudovegetus</i> + | G5, S1, E |
| 042. <i>Desmodium humifusum</i> + | G1G2Q, S1, E, LP |
| 043. <i>Desmodium laevigatum</i> | G5, S3 |
| 044. <i>Desmodium nuttallii</i> ‡ | G5, S2 |
| 045. <i>Desmodium strictum</i> | G4, S2, LP |
| 046. <i>Desmodium viridiflorum</i> | G5?, S2 |
| 047. <i>Diodia virginiana</i> var. <i>virginiana</i> + | G5, S1, E, LP |
| 048. <i>Doellingeria infirma</i> (≡ <i>Aster infirmus</i>)‡ | G5, S2 |
| 049. <i>Elatine americana</i> | G4, S2 |
| 050. <i>Elatine minima</i> + | G5, S3 |
| 051. <i>Eleocharis equisetoides</i> ‡ | G4, S1, E, LP |
| 052. <i>Eleocharis melanocarpa</i> ‡ | G4, S1, E, LP |
| 053. <i>Eleocharis minima</i> ‡ | G5, SX.1 |
| 054. <i>Eleocharis olivacea</i> var. <i>reductiseta</i> + | G5T1T2, S1S2, E, LP |
| 055. <i>Eleocharis quadrangulata</i> ‡ | G4, S3 |
| 056. <i>Eleocharis tortilis</i> ! | G5, S1, S1S2, E, LP |
| 057. <i>Epilobum angustifolium</i> var. <i>circumvagum</i> ‡ | G5T5, S1S2 |
| 058. <i>Epilobum leptophyllum</i> ‡ | G5, S2 |
| 059. <i>Eragrostis hirsuta</i> + | G5, S1.1, E, LP |
| 060. <i>Eriocaulon parkeri</i> | G3, S2 |
| 061. <i>Eriophorum tenellum</i> ‡ | G5, S1, E, LP |
| 062. <i>Eryngium aquaticum</i> var. <i>aquaticum</i> ‡ | G4T4, S3 |
| 063. <i>Euonymus atropurpureus</i> var. <i>atropurpureus</i> | G5T5, S1? |
| 064. <i>Eupatorium aromaticum</i> var. <i>aromaticum</i> ‡ | G5T5, S1 |
| 065. <i>Eupatorium capillifolium</i> + | G5, S1S2, E, LP |
| 066. <i>Eupatorium coelestinum</i> ! | G5, S3 |
| 067. <i>Eupatorium resinosum</i> | G3, S2, E, LP |
| 068. <i>Euphorbia corollata</i> ‡ | G5, S1 |
| 069. <i>Fimbristylis castanea</i> | G5, S3 |
| 070. <i>Galactia volubilis</i> ‡ | G5, SH, E, LP |
| 071. <i>Gentiana autumnalis</i> ‡ | G3, S3, LP |
| 072. <i>Gentiana saponaria</i> var. <i>saponaria</i> | G5T5, S3 |
| 073. <i>Gentiana villosa</i> ‡ | G4, SX.1 |
| 074. <i>Glyceria laxa</i> ‡ | G5, S1 |
| 075. <i>Gnaphalium helleri</i> var. <i>micradenium</i> ‡ | G4G5T3, SH, E |
| 076. <i>Gratiola pilosa</i> ! | G5?, S2 |

| Taxon | Rarity Status |
|---|-------------------|
| 077. <i>Gratiola virginiana</i> | G5, S2 |
| 078. <i>Gymnopogon ambiguus</i> | G4, S3 |
| 079. <i>Helonias bullata</i> | G3, S3, LT, E, LP |
| 080. <i>Hydrocotyle verticillata</i> var. <i>verticillata</i> | G5T5, S3 |
| 081. <i>Hypericum adpressum</i> | G3, S2, E, LP |
| 082. <i>Hypericum gymnanthum</i> ! | G4, S1, E, LP |
| 083. <i>Isoetes riparia</i> | G5?T5?Q, S3 |
| 084. <i>Juncus caesariensis</i> ! | G2G3, S2, E, LP |
| 085. <i>Lactuca hirsuta</i> var. <i>sanguinea</i> | G5?T5?, S2 |
| 086. <i>Leptochloa fascicularis</i> var. <i>maritima</i> ! | G5T3T4Q, S2 |
| 087. <i>Lespedeza stuevei</i> | G4?, S2 |
| 088. <i>Liatris spicata</i> var. <i>spicata</i> | G5T5?, S3 |
| 089. <i>Linum intercursum</i> ‡ | G4, S1, E, LP |
| 090. <i>Linum virginianum</i> | G4, S3 |
| 091. <i>Liparis liliifolia</i> | LP |
| 092. <i>Liparis loeselii</i> ‡ | LP |
| 093. <i>Listera australis</i> | G4, S3, LP |
| 094. <i>Lobelia canbyi</i> | G4, S3, LP |
| 095. <i>Ludwigia hirtella</i> ‡ | G5, S2, LP |
| 096. <i>Lupinus perennis</i> var. <i>perennis</i> | G5T5?, S3 |
| 097. <i>Lycopodiella caroliniana</i> var. <i>caroliniana</i> | G5T4, S3 |
| 098. <i>Lycopus americanus</i> var. <i>longii</i> + | G5TNRQ, S2S3 |
| 099. <i>Lycopus rubellus</i> | G5, S2 |
| 100. <i>Lysimachia hybrida</i> ‡ | G5, S3 |
| 101. <i>Lythrum lineare</i> ‡ | G5, S3 |
| 102. <i>Malus angustifolia</i> var. <i>puberula</i> | G5?T2T4, S2 |
| 103. <i>Muhlenbergia torreyana</i> ! | G3, S3, LP |
| 104. <i>Myosotis verna</i> | G5, S3 |
| 105. <i>Myriophyllum heterophyllum</i> | G5, S2 |
| 106. <i>Myriophyllum pinnatum</i> ‡ | G5, S1, E, LP |
| 107. <i>Myriophyllum verticillatum</i> ‡ | G5, SH, E, LP |
| 108. <i>Najas gracillima</i> ‡ | G5?, S2 |
| 109. <i>Nuphar microphyllum</i> ‡ | G5T4T5, SH, E, LP |
| 110. <i>Nymphoides cordata</i> | G5, S3, LP |
| 111. <i>Obolaria virginica</i> ‡ | G5, S2 |
| 112. <i>Onosmodium virginianum</i> | G4, S1, E, LP |
| 113. <i>Ophioglossum pusillum</i> (=O. <i>vulgatum</i> var. <i>pseudopodium</i>) | G5, S3 |
| 114. <i>Ophioglossum vulgatum</i> (=O. <i>vulgatum</i> var. <i>pynostichum</i>)‡ | G5, S1, E, LP |

| Taxon | Rarity Status |
|---|----------------|
| 115. <i>Orthilia secunda</i> ‡ | G5, S2 |
| 116. <i>Panicum amarum</i> var. <i>amarulum</i> | G5T3T5, S3 |
| 117. <i>Panicum boreale</i> (≡ <i>Dichanthelium boreale</i>)‡ | G5, S1, E, LP |
| 118. <i>Panicum hemitomom</i> | G5?, S2, LP |
| 119. <i>Panicum leucothrix</i> (≡ <i>D. leucothrix</i>)‡ | G4?Q, S1S2 |
| 120. <i>Panicum oligosanthos</i> var. <i>oligosanthos</i> (≡ <i>D. oligosanthos</i> var. <i>oligosanthos</i>)‡ | G5T5, S1S2 |
| 121. <i>Panicum scabriusculum</i> (≡ <i>D. scabriusculum</i> ; = <i>D. cryptanthum</i>)‡ | G4, S3 |
| 122. <i>Panicum tenue</i> (≡ <i>D. tenue</i>)‡ | G4T4T5, SH |
| 123. <i>Panicum wrightianum</i> (≡ <i>D. wrightianum</i> , <i>D. acuminatum</i> var. <i>wrightianum</i>)! | G4, S2 |
| 124. <i>Pasaplum dissectum</i> ! | G4?, S2 |
| 125. <i>Pasaplum setaceum</i> var. <i>ciliatifolium</i> | G5T5, S2 |
| 126. <i>Pasaplum setaceum</i> var. <i>psammophilum</i> | G5T4?, S2 |
| 127. <i>Penstemon laevigatus</i> ‡ | G5, S1, E, LP |
| 128. <i>Phaseolus polystachyos</i> var. <i>polystachyos</i> + | G5T5?, S2 |
| 129. <i>Phoradendron leucarpum</i> (= <i>P. serotinum</i> , <i>P. flavescens</i>) | LP |
| 130. <i>Pinus serotina</i> | G5, S2 |
| 131. <i>Pinus taeda</i> | G5, S2 |
| 132. <i>Plantago pusilla</i> + | G5, SH, E |
| 133. <i>Platanthera ciliaris</i> | G5, S2, LP |
| 134. <i>Platanthera cristata</i> | G5, S3, LP |
| 135. <i>Pluchea camphorata</i> + | G5, SX.1 |
| 136. <i>Polygala curtissii</i> + | G5, S1.1, LP |
| 137. <i>Polygala incarnata</i> ‡ | G5, SH, LE, LP |
| 138. <i>Polygala mariana</i> | G5, S2, LP |
| 139. <i>Polygala polygama</i> ! | G5, S2 |
| 140. <i>Polygonum densiflorum</i> ‡ | G5, S1, LE, LP |
| 141. <i>Polygonum erectum</i> | G5, S3 |
| 142. <i>Polygonum hydropiperoides</i> var. <i>opelousanum</i> ‡ | G5TNRQ, S2 |
| 143. <i>Polygonum setaceum</i> var. <i>setaceum</i> ‡ | G5T3T5, S2 |
| 144. <i>Populus heterophylla</i> | G5, S2 |
| 145. <i>Potamogeton confervoides</i> | G4, S2 |
| 146. <i>Potamogeton oakesianus</i> | G4, S2 |
| 147. <i>Prenanthes autumnalis</i> ?‡ | G4G5, S2, LP |
| 148. <i>Proserpinaca intermedia</i> | G4?Q, S3 |
| 149. <i>Puccinellia fasciculata</i> ! | G3G5, S1S2 |
| 150. <i>Pycnanthemum setosum</i> ‡ | G4, S3 |
| 151. <i>Pyrola chlorantha</i> ‡ | G5, S1 E, LP |
| 152. <i>Pyrrhopappus carolinianus</i> + | G5, S1, E, LP |

| Taxon | Rarity Status |
|--|---------------------|
| 153. <i>Quercus lyrata</i> + | G5, S1, E, LP |
| 154. <i>Quercus michauxii</i> | G5, S3 |
| 155. <i>Quercus nigra</i> | G5, S1, E |
| 156. <i>Rhexia mariana</i> var. <i>ventricosa</i> + | G4T4T5, S1, E, LP |
| 157. <i>Rhododendron atlanticum</i> | G4G5, S2 |
| 158. <i>Rhynchospora inundata</i> ‡ | G4?, S2, LP |
| 159. <i>Rhynchospora microcephala</i> ‡ | G5T5, S1, E, LP |
| 160. <i>Rhynchospora nitens</i> | G4?, S2 |
| 161. <i>Rhynchospora pallida</i> ‡ | G3, S3 |
| 162. <i>Rhynchospora scirpoides</i> | G4, S2 |
| 163. <i>Rotala ramosior</i> | G5, S3 |
| 164. <i>Rudbeckia fulgida</i> var. <i>fulgida</i> ‡ | G5T4?, S1, E, LP |
| 165. <i>Ruellia caroliniensis</i> ‡ | G5, SH, E, LP |
| 166. <i>Sabatia campanulata</i> | G5, S3 |
| 167. <i>Sagittaria subulata</i> | G4, S2 |
| 168. <i>Sagittaria teres</i> + | G3, S1, E, LP |
| 169. <i>Schizaea pusilla</i> ! | G3G4, S3, LP |
| 170. <i>Schoenoplectus maritimus</i> (≡ <i>Scirpus maritimus</i>)+ | G5, S1, E, LP |
| 171. <i>Schoenoplectus novae-angliae</i> (≡ <i>Scirpus novae-angliae</i>) | G5, S2 |
| 172. <i>Schoenoplectus smithii</i> + | G5?, S2 |
| 173. <i>Schwalbea americana</i> ‡ | G2G3, S1, LE, E, LP |
| 174. <i>Scleria minor</i> | LP |
| 175. <i>Scleria pauciflora</i> var. <i>caroliniana</i> + | G5T4T5, S2 |
| 176. <i>Scleria reticularis</i> | LP |
| 177. <i>Senecio tomentosus</i> ! | G4G5, S2 |
| 178. <i>Sesuvium maritimum</i> + | G5, S2 |
| 179. <i>Setaria magna</i> ! | G4G5, S2 |
| 180. <i>Silene caroliniana</i> var. <i>pennsylvanica</i> | G5T4T5, S3 |
| 181. <i>Sisyrinchium fuscatum</i> (= <i>S. arenicola</i>)! | G5?, S2 |
| 182. <i>Solidago elliotii</i> | G5, S3 |
| 183. <i>Solidago stricta</i> ?‡+ | G5, S3, LP |
| 184. <i>Solidago tarda</i> + | G4?Q, S3 |
| 185. <i>Spiranthes odorata</i> ‡ | G5, S2 |
| 186. <i>Spiranthes tuberosa</i> | G5, S3, LP |
| 187. <i>Sporobolus clandestinus</i> ‡ | G5, S3 |
| 188. <i>Sporobolus compositus</i> var. <i>compositus</i> ‡ | G5T5, S2 |
| 189. <i>Stachys byssopifolia</i> ‡ | G4G5, S2 |
| 190. <i>Stylosanthes biflora</i> | G5, S3 |

| Taxon | Rarity Status |
|---|----------------|
| 191. <i>Suaeda calceoliformis</i> ! | G5, S3 |
| 192. <i>Toxicodendron pubescens</i> (= <i>T. toxicarium</i>) | G5, S3 |
| 193. <i>Trichostema setaceum</i> | G5, S2 |
| 194. <i>Utricularia biflora</i> + | G5, S1, E, LP |
| 195. <i>Utricularia gibba</i> | G5, S3, LP |
| 196. <i>Utricularia inflata</i> | G5, S3 |
| 197. <i>Utricularia purpurea</i> | G5, S3, LP |
| 198. <i>Utricularia radiata</i> | G4, S3 |
| 199. <i>Utricularia resupinata</i> + | G4, S2, E, LP |
| 200. <i>Valerianella radiata</i> + | G5, S1, E, LP |
| 201. <i>Vernonia glauca</i> ! | G5, S1, E, LP |
| 202. <i>Viola brittoniana</i> var. <i>brittoniana</i> | G4G5T4T5, S3 |
| 203. <i>Viola hirsutula</i> | G4, S2 |
| 204. <i>Xyris jupicai</i> + | G5, S3 |
| 205. <i>Zigadenus leimanthoides</i> ‡ | G4Q, S1, E, LP |

Table 3. Species (93) reported from Cumberland County that are reported as invasive in New Jersey, Delaware, New York or Pennsylvania. For invasive status in New Jersey, only those ranked as Category 1 or 2 by Snyder (2009a, 2009b) are included in the list below. For Delaware, those indicated with a W are recognized as widespread invasives and those with an R as restricted invasives (Delaware Invasive Species Council, 2014). For New York, those indicated with an X are listed as invasive pursuant to New York Codes, Rules and Regulations (NYCRR) Part 575.3(2) Prohibited Invasive Plants. For Pennsylvania, those species indicated with an X are recognized as invasive and those indicated with a W are on Pennsylvania’s Watch List (Pennsylvania Department of Conservation and Natural Resources 2014). The 33 species with a plus sign (+) were not included in the original list (Moore 1989) but are newly reported here. Four taxa reported in Table 2, *Cabomba caroliniana*, *Myriophyllum heterophyllum*, *Typha angustifolia*, *T. ×glauca*, are taken as native in Cumberland Co. in this work and the previous list, but are treated as non-native and invasive by New York or Pennsylvania.

| SPECIES | NJ | DE | NY | PA |
|--|----|----|----|----|
| 01. <i>Acer platanoides</i> | 1 | W | | X |
| 02. <i>Acer pseudoplatanus</i> + | | | X | X |
| 03. <i>Acorus calamus</i> | 2 | W | | |
| 04. <i>Ailanthus altissima</i> | 1 | R | | X |
| 05. <i>Akebia quinata</i> | | | | X |
| 06. <i>Albizia julibrissin</i> | | | | X |
| 07. <i>Alliaria petiolata</i> + | 1 | R | X | X |
| 08. <i>Amaranthus hybridus</i> | 2 | | | |
| 09. <i>Amaranthus retroflexus</i> | 2 | | | |
| 10. <i>Amorpha fruticosa</i> + | 2 | | | |
| 11. <i>Ampelopsis brevipedunculata</i> + | 1 | R | X | X |

| SPECIES | NJ | DE | NY | PA |
|--|----|----|----|----|
| 12. <i>Anthemis arvensis</i> | 2 | | | |
| 13. <i>Aralia elata</i> + | 2? | | X | X |
| 14. <i>Artemisia vulgaris</i> + | | | X | |
| 15. <i>Berberis thunbergii</i> + | 1 | R | X | X |
| 16. <i>Bromus tectorum</i> | | | | X |
| 17. <i>Broussonetia papyrifera</i> | | | | W |
| 18. <i>Cabomba caroliniana</i> + | | | X | X |
| 19. <i>Cardamine impatiens</i> + | 1? | | X | X |
| 20. <i>Carduus nutans</i> subsp. <i>macrolepis</i> | 2 | | | X |
| 21. <i>Catalpa bignonioides</i> | 2 | | | |
| 22. <i>Celastrus orbiculatus</i> + | 1 | W | X | X |
| 23. <i>Centaurea stoebe</i> (=C. <i>biebersteinii</i> , C. <i>maculosa</i>) | 1 | R | X | X |
| 24. <i>Chelidonium majus</i> | | | | X |
| 25. <i>Cirsium arvense</i> | 1 | | X | X |
| 26. <i>Cirsium vulgare</i> | 2 | | | X |
| 27. <i>Clematis terniflora</i> + | 1 | W | | |
| 28. <i>Conium maculatum</i> | | | | X |
| 29. <i>Cyperus iria</i> + | 2 | | | |
| 30. <i>Datura stramonium</i> | | | | X |
| 31. <i>Duchesnea indica</i> + | 2 | | | |
| 32. <i>Elaeagnus umbellata</i> var. <i>parvifolia</i> | 1 | W | X | X |
| 33. <i>Eragrostis curvula</i> + | 1 | | | |
| 34. <i>Euonymus alatus</i> + | 1 | R | | X |
| 35. <i>Euonymus fortunei</i> + | 2? | | | X |
| 36. <i>Euphorbia cyparissias</i> | 2 | | X | |
| 37. <i>Glechoma hederacea</i> | 2 | | | |
| 38. <i>Hedera helix</i> + | 1 | | | X |
| 39. <i>Helianthus petiolaris</i> subsp. <i>petiolaris</i> | 2 | | | |
| 40. <i>Hemorocallis fulva</i> | | | | W |
| 41. <i>Hesperis matronalis</i> | | | | X |
| 42. <i>Holcus lanatus</i> | | | | W |
| 43. <i>Humulus japonicus</i> + | | | X | X |
| 44. <i>Iris pseudacorus</i> | 2 | | X | X |
| 45. <i>Lamium amplexicaule</i> | 2 | | | |
| 46. <i>Lespedeza bicolor</i> | | | | X |
| 47. <i>Lespedeza cuneata</i> | 1 | | X | X |
| 48. <i>Ligustrum obtusifolium</i> + | | W | X | X |
| 49. <i>Ligustrum vulgare</i> | 2 | W | | X |
| 50. <i>Lonicera japonica</i> | 1 | W | X | X |

| SPECIES | NJ | DE | NY | PA |
|---|----|----|----|----|
| 51. <i>Lonicera maackii</i> | 2 | R | X | X |
| 52. <i>Lonicera morrowii</i> | | W | X | X |
| 53. <i>Lythrum salicaria</i> + | 1 | R | X | X |
| 54. <i>Melilotus officinalis</i> + | 2 | | | |
| 55. <i>Microstegium vimineum</i> + | 1 | W | X | X |
| 56. <i>Miscanthus sinensis</i> + | 2 | | | W |
| 57. <i>Morus alba</i> | | | | W |
| 58. <i>Murdannia keisak</i> + ¹ | | R | X | |
| 59. <i>Myriophyllum aquaticum</i> + | | | X | X |
| 60. <i>Myriophyllum heterophyllum</i> | | | X | |
| 61. <i>Ornithogalum umbellatum</i> | | | | X |
| 62. <i>Pachysandra terminalis</i> + | | | | W |
| 63. <i>Pastinaca sativa</i> | | | | X |
| 64. <i>Paulownia tomentosa</i> | | | | X |
| 65. <i>Perilla frutescens</i> | | | | X |
| 66. <i>Phalaris arundinacea</i> | | R | | |
| 67. <i>Phalaris canariensis</i> | 2 | | | |
| 68. <i>Phragmites australis</i> subsp. <i>australis</i> | | W | X | X |
| 69. <i>Poa trivialis</i> | | | | W |
| 70. <i>Polygonum cuspidatum</i> (=Fallopia japonica, Reynoutria japonica) | 1 | W | X | X |
| 71. <i>Polygonum longisetum</i> (≡ <i>Polygonum caespitosum</i> var. <i>longisetum</i> , <i>Persicaria longisetum</i>) | | | | X |
| 72. <i>Polygonum perfoliatum</i> (≡ <i>Persicaria perfoliata</i>)+ | 1 | W | X | X |
| 73. <i>Polygonum sachalinense</i> (≡ <i>Fallopia sachalinensis</i> , <i>Reynoutria sachalinensis</i>)+ | | | X | X |
| 74. <i>Pueraria montana</i> var. <i>lobata</i> + | 2 | | | X |
| 75. <i>Pyrus calleryana</i> + | 2? | R | | X |
| 76. <i>Ranunculus ficaria</i> var. <i>bulbifera</i> (=Ficaria verna)+ | 1 | R | X | X |
| 77. <i>Robinia pseudoacacia</i> | 1 | | | |
| 78. <i>Rorippa nasturtium-aquaticum</i> (≡ <i>Nasturtium officinale</i>) | 2 | | | |
| 79. <i>Rosa multiflora</i> | 1 | W | X | X |
| 80. <i>Rubus laciniatus</i> | 2 | | | |
| 81. <i>Rubus phoenicolasius</i> + | 1 | W | X | X |
| 82. <i>Schedonorus arundinaceus</i> (≡ <i>Festuca arundinaceus</i>) | | | | W |
| 83. <i>Sorghum halepense</i> | | | | X |
| 84. <i>Symphoricarpos albus</i> | 2 | | | |
| 85. <i>Symphoricarpos orbiculatus</i> | 2 | | | |
| 86. <i>Typha angustifolia</i> | | | | X |
| 87. <i>Typha</i> × <i>glauc</i> a | | | | X |
| 88. <i>Ulmus pumila</i> | | | | X |

| SPECIES | NJ | DE | NY | PA |
|---------------------------------|----|----|----|----|
| 89. <i>Veronica hederifolia</i> | 2 | | | |
| 90. <i>Viburnum dilatatum</i> + | 2 | | | W |
| 91. <i>Viburnum sieboldii</i> + | 2? | | | W |
| 92. <i>Vinca minor</i> | 2 | | | W |
| 93. <i>Wisteria floribunda</i> | 1 | | | W |

¹ While listed by New York as invasive, *Murdannia keisak* has not yet been reported from the state (Glenn and Moore 2009b).

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ADDENDA

1. Add: [in Haloragidaceae] *Proserpinaca intermedia*, rare*. This species is included in Table 2, but was not included in the original checklist (Moore 1989), it being treated as a synonym of *P. palustris* var. *palustris*. Material that keys to *P. intermedia* has been observed in intermittent ponds in eastern Vineland.
2. Add: [in Poaceae] [*Arthraxon hispidus*]†, rare. Native to southeastern Asia, a population was observed by the first author in 2016 in a restored freshwater marsh in Vineland along the Blackwater Branch near its confluence with the Maurice River.
3. Add: [in Poaceae] *Phragmites australis* subsp. *americanus*, rare. Meadows and Saltonstall (J. Torrey Bot. Soc. 134: 99-107. 2007) reported the native subspecies of this grass (Poaceae) from the county along the Cohansey River E of Fairton and S of Bridgeton in Fairfield and Hopewell Twps.
4. Add the following entries to Table 2:

| | |
|-----------------------------|----------|
| <i>Agalinis fasciculata</i> | G5, S3 |
| <i>Smilax laurifolia</i> ! | G5, S3 |
| <i>Smilax pseudochina</i> | G4G5, S3 |
| <i>Smilax pulverulenta</i> | G4G5, S3 |

5. Add the following entry to Table 3:

| | | | | |
|---------------------------|------|------|------|------|
| | [NJ] | [DE] | [NY] | [PA] |
| <i>Arthraxon hispidus</i> | 2 | | X | W |

Material referable to *Agalinis fasciculata* as applied in Snyder 2013 was reported in the original checklist (Moore 1989) under the name *A. virgata*. The *Smilax* species were included in the original list (Moore 1989), but were inadvertently omitted from Table 2. These additions bring the total number of rare taxa to 209 (reported as 205 in the abstract, discussion, and Table 2 legend). *Smilax laurifolia* was reported as historical in the original list but is reported here as rediscovered, thus bringing the total number of species originally reported as historical but now known to be extant in the county to 24 (reported as 23 the abstract, discussion, and Table 2 legend.). The addition of *Arthraxon hispidus* to Table 3 brings the total number of invasive species to 94 (reported as 93 in the abstract, discussion, and Table 3 legend). These bring the total number of additions to 205 (83 native species, 117 non-native species, 1 subspecies, 4 hybrids), raising the total number of species reported from the county to 1533 (1095 native, 438 non-native).

While the proofs were being reviewed, Snyder, D. B., *List of Endangered Plant Species and Plant Species of Concern. June 2016* was published by the New Jersey Natural Heritage Program (<http://www.nj.gov/dep/parksandforests/natural/heritage/njplantlist.pdf>). This list effectively supersedes the Snyder 2013 list on which Table 2 was based. Table 2 could not be updated to reflect this new list. A summary of the changes needed in Table 2 to reflect the information in Snyder 2016 is available from the first author upon request.

Multitemporal phenological floristic analysis of the shores of Lake Issaqueena, South Carolina

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ABSTRACT. Linking historic herbarium collections with current geospatial temporal floristic and phenological data is crucial for environmental change research and education. The floristic and phenological (flowering) study of Lake Issaqueena in Pickens County, SC, conducted by William Pamplin in 1970–1971 was reinvestigated in 2011–2012 using the Carolina Vegetative Survey (CVS) natural community sampling methods and photo documentation using a GPS-enabled camera to determine floristic and phenological changes for this site during the forty years separating these two studies. Phenological events (flowering) were recorded via photographs taken by a GPS-enabled camera on a monthly basis. Photographs were downloaded and organized by sampling date in Picasa 3 web albums and stored in a project Google website. Precipitation in 1970, 2011 and 2012 was below the long-term average and this combined with higher than average air temperature impacted drought severity in the area. Comparison of phenologies indicated 269 plant species blooming in 1970–1971 compared to 203 plants blooming in 2011–2012, and 149 common plant species blooming in both study periods. The blooming period was 11 months in 2011–2012 compared to 8 months in 1970–1971. A majority of plants were blooming earlier and longer in 2011–2012 than in 1970–1971. Repeat photography and data storage using website have a great potential to enhance phenological research by linking it to historical herbarium collections.

Keywords: Carolina Vegetative Survey (CVS), digital imaging, environmental, image processing, repeat photography, vegetation dynamics

INTRODUCTION

Changes are occurring in the floristic composition of natural communities, phenology, and distribution of plant species, and these changes are often attributed to climate change and anthropogenic activity (Parmesan 2006; Ceschin et al. 2009). Accurate forecasting of how plants will respond to climatic and anthropogenic changes is complicated by temporal variation in climate and environment, lack of long-term data, differences in field and laboratory experiments, and many other factors (Parmesan 2006; Pau et al. 2011; Wilfried et al. 2008). Floristic and phenological changes can have significant implications on agricultural production (Fuhrer 2003). Historical records of harvest dates can be used to reconstruct past climate (Chuine et al. 2004).

Phenology and climate are intimately linked (Cleland et al. 2007). Climate change can significantly impact winter chill for temperate fruit and nut production (Luedeling 2012). Global temperatures are expected to rise by up to 6° C by the end of the 21st century, compared to pre-industrial levels (IPCC 2007) and these temperatures are expected to remain unstable (Else and Atkinson 2010). Current phenological studies include walnuts (Luedeling and Gassner 2012), apples (Rana et al. 2011), apricots (Campoy et al. 2011), pears (Guedon and Legave 2008), and many other important fruits and nuts. Long-term data are essential for sustainable crop production in the future.

Floristic studies are often used for agricultural and environmental monitoring and assessment (Ceschin et al. 2009). Mikhailova et al. (2000) documented changes in botanical composition between native grassland (not cultivated for at least 300 years), a grazed/hay field with 4 years of annual harvest followed by 1 year of rest (periodically-cut grazed/hay field), and a yearly-cut grazed/hay field in the V.V. Alekhin Central-Chernozem Biosphere State Reserve in the Kursk region of Russia (listed in the UNESCO – MAB Biosphere Reserves directory). Floristic analysis can be conducted in urban environments as well. Ceschin et al. (2009) reported that over 40% of species documented within an archaeological site in Rome disappeared when current floristic data was compared with historical floristic data collected in 1955 on the same site.

Floristic and phenological studies can be conducted with different approaches including: species-level observation networks, remote sensing, and global change experiments and at different temporal and spatial scales (species-level, plot size, ecosystem- and global-scale etc., Cleland et al. 2007). Species-level phenology relies on volunteers to collect observations of various phenophases (a particular stage of development, e.g. flowering, fruiting, etc.) of plants at numerous locations (Cleland et al. 2007). Some of the longest and best known plant phenological records come from China (Chen 2003) and Japan (Aono and Kazui 2008). As noted by Cleland et al. (2007), most of the phenological and floristic studies are concentrated in temperate climates. As time goes by, more and more species-level studies are being completed.

This study is based on the discovery of floristic and phenological analysis by Pamplin (1971) of the shores of Lake Issaqueena in Pickens County, SC, which can be potentially included in the species-level observation networks since it is managed by the Clemson University Experimental Forest personnel. Pamplin (1971) utilized traditional floristic inventory methods based on expert knowledge and field collection of plant material, much of which is stored in the Clemson University Herbarium (<http://www.clemson.edu/cafls/herbarium/>). Forty years later, floristic and phenological changes were documented using a GPS-enabled camera to make spatial record of these observations.

The specific objectives of the study were to: 1) conduct a plant inventory of the shores of Lake Issaqueena, South Carolina using the Carolina Vegetative Survey (CVS plots); 2) take a phenological inventory using a GPS-enabled camera; and 3) compare floristic and phenological composition in 1970–1971 and 2011–2012 in the same research area.

METHODS

Study Site. Lake Issaqueena was included in a Land Use Project introduced in 1934 that covered thousands of acres encompassing Clemson University (Figure 1, Table 1). The main purpose of the Land Use Project was to rehabilitate the eroded land and reintroduce native plants and wildlife (Pamplin 1971). Clemson University acquired the deed for this

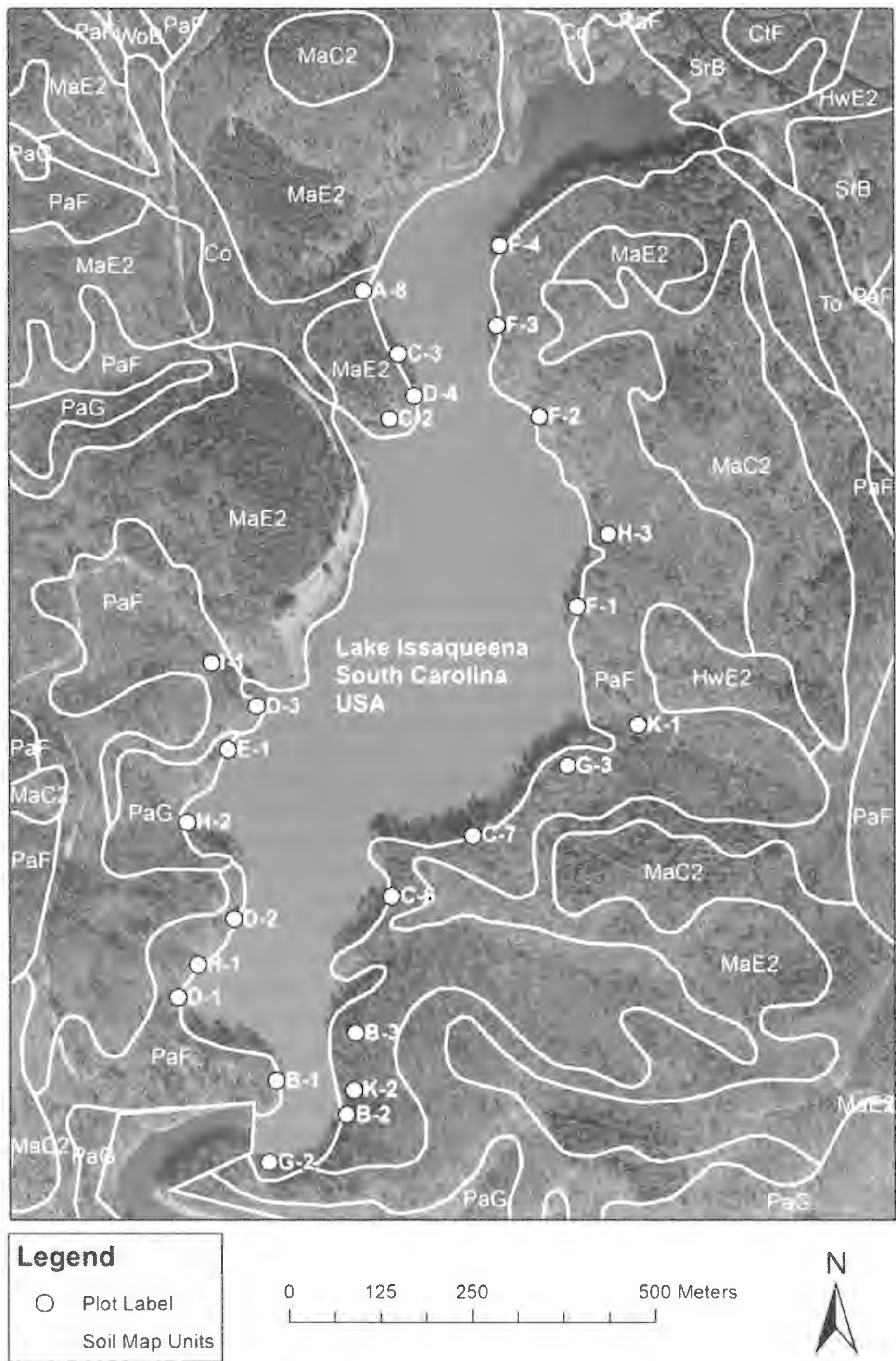


Fig. 1. Aerial photograph and principle plant communities of the shores of Lake Issaqueena.

Table 1. Principle plant communities of the shores of Lake Issaqueena 2011–2012 (see Figure 1 for locations on the map).

| No. | Principal Communities | Plot Label | Origin GPS Point | End GPS Point |
|-----|--------------------------------|------------|--------------------------------------|--------------------------------------|
| 1 | Mixed Pine Plantation | A-8 | N 34° 44' 43" 04 W 82° 51' 46" 26 | N 34° 44' 42" 67 W 82° 51' 47" 97 |
| 2 | Pine-Oak Community | B-1 | N 34° 44' 07" 99 W 82° 51' 50" 22 | N 34° 44' 07" 74 W 82° 51' 52" 02 |
| 3 | Pine-Oak Community | B-2 | N 34° 44' 06" 54 W 82° 51' 46" 42 | N 34° 44' 06" 40 W 82° 51' 45" 31 |
| 4 | Pine-Oak Community | B-3 | N 34° 44' 10" 15 W 82° 51' 46" 03 | N 34° 44' 09" 78 W 82° 51' 45" 49 |
| 5 | Pine-Hardwood Community | C-2 | N 34° 44' 37" 38 W 82° 51' 44" 76 | N 34° 44' 38" 76 W 82° 51' 44" 79 |
| 6 | Pine-Hardwood Community | C-3 | N 34° 44' 40" 27 W 82° 51' 44" 33 | N 34° 44' 39" 79 W 82° 51' 45" 70 |
| 7 | Pine-Hardwood Community | C-6 | N 34° 44' 16" 23 W 82° 51' 44" 22 | N 34° 44' 15" 21 W 82° 51' 43" 04 |
| 8 | Pine-Hardwood Community | C-7 | N 34° 44' 19" 00 W 82° 51' 39" 91 | N 34° 44' 17" 26 W 82° 51' 39" 67 |
| 9 | Oak-Hickory Community | D-1 | N 34° 44' 11" 59 W 82° 51' 55" 59 | N 34° 44' 12" 78 W 82° 51' 56" 84 |
| 10 | Oak-Hickory Community | D-2 | N 34° 44' 15" 10 W 82° 51' 52" 66 | N 34° 44' 16" 37 W 82° 51' 53" 37 |
| 11 | Oak-Hickory Community | D-3 | N 34° 44' 24" 55 W 82° 51' 51" 63 | N 34° 44' 24" 82 W 82° 51' 52" 23 |
| 12 | Oak-Hickory Community | D-4 | N 34° 44' 38" 42 W 82° 51' 43" 45 | N 34° 44' 38" 63 W 82° 51' 44" 64 |
| 13 | Hickory Community | E-1 | N 34° 44' 22" 60 W 82° 51' 53" 12 | N 34° 44' 23" 07 W 82° 51' 54" 35 |
| 14 | Mixed Hardwood Community | F-1 | N 34° 44' 29" 22 W 82° 51' 34" 52 | N 34° 44' 29" 21 W 82° 51' 33" 49 |
| 15 | Mixed Hardwood Community | F-2 | N 34° 44' 37" 59 W 82° 51' 36" 69 | N 34° 44' 35" 86 W 82° 51' 32" 79 |
| 16 | Mixed Hardwood Community | F-3 | N 34° 44' 41" 61 W 82° 51' 40" 49 | N 34° 44' 36" 97 W 82° 51' 34" 83 |
| 17 | Mixed Hardwood Community | F-4 | N 34° 44' 45" 15 W 82° 51' 38" 98 | N 34° 44' 44" 13 W 82° 51' 37" 00 |
| 18 | Oak-Beech Community | G-2 | N 34° 44' 04" 38 W 82° 51' 50" 55 | N 34° 44' 03" 21 W 82° 51' 51" 27 |
| 19 | Oak-Beech Community | G-3 | N 34° 44' 22" 15 W 82° 51' 34" 89 | N 34° 44' 22" 98 W 82° 51' 34" 78 |
| 20 | Tulip Poplar-Hickory Community | H-1 | N 34° 44' 13" 04 W 82° 51' 53" 04 | N 34° 44' 14" 19 W 82° 51' 56" 20 |
| 21 | Tulip Poplar-Hickory Community | H-2 | N 34° 44' 19" 36 W 82° 51' 55" 25 | N 34° 44' 18" 53 W 82° 51' 56" 66 |

| No. | Principal Communities | Plot Label | Origin GPS Point | End GPS Point |
|-----|-----------------------------------|------------|--------------------------------------|--------------------------------------|
| 22 | Tulip Poplar-Hickory Community | H-3 | N 34° 44' 32" 46 W 82° 51' 32" 18 | N 34° 44' 32" 21 W 82° 51' 30" 02 |
| 23 | Beech Community | I-1 | N 34° 44' 26" 43 W 82° 51' 54" 09 | N 34° 44' 25" 44 W 82° 51' 54" 91 |
| 24 | Mesic Mixed Hardwood Community | K-1 | N 34° 44' 24" 01 W 82° 51' 31" 14 | N 34° 44' 22" 88 W 82° 51' 29" 11 |
| 25 | Mesic Mixed Hardwood Community | K-2 | N 34° 44' 07" 62 W 82° 51' 46" 06 | N 34° 44' 07" 81 W 82° 51' 45" 10 |

land in 1954 and created Clemson Experimental Forest (Pamplin 1971). Currently, the Lake Issaqueena section of the Clemson Forest is used by the public for hiking, fishing, horseback riding, and biking. There are areas for picnicking on the south west side of the lake and hunting is permitted in designated areas during specific times (Pamplin 1971). This site is within the Southern Outer Piedmont eco-region (Griffith et al. 2002). Mean temperatures for this site range from -2°C to 10°C in January. Summer temperatures range from 20°C to 32°C in July (Griffith et al. 2002). There are between 190 and 230 frost-free days annually, and mean annual precipitation ranges from 112 to 142 cm (Griffith et al. 2002). Historical climatological data were obtained from the United States Historical Climatology Network (CDIAC 2013). Available soil inventory data was obtained using Web Soil Survey (Soil Survey Staff 2012).

Plant collection in 1970–1971. The detailed plant survey of the study area was performed in 1970–1971 (Pamplin 1971; Pamplin and Fairey 1977) on a monthly basis for each month of each year. The primary goal of this study was to perform an updated inventory of the plant species present at Lake Issaqueena. Plants were collected in the field and additional information was recorded such as: flowering time, habitat type, aspect (North, South, East, and West), and occurrence. According to the 1970–1971 study, the overall collection of plant species yielded a total of 1100 specimens that were properly identified and stored within the Clemson University Herbarium. The collections consisted of 468 species (Pamplin 1971).

Plant collection in 2011–2012. The Carolina Vegetation Survey sampling methodology (Peet et al. 1998) was used for floristic inventory and identification. The 20 by 50 meter plots were positioned perpendicular to the shores of Lake Issaqueena with the origin point closest to the edge of the lake and the end point furthest away. Each 20 by 50 meter plot consisted of 10 modules each measuring 10m by 10m. Four of these 10 modules were designated as the intensive modules, or the modules receiving a more thorough examination compared to the other 6 modules within the plot. The four modules closest to the shores of Lake Issaqueena were designated the intensive modules in order to more thoroughly examine the research area between the lake and trails.

Phenological inventory. Blooming plants and plots were recorded via GPS enabled camera (Casio EX-H20G) and/or collected for future identification by montly survey during each month of the survey year. The GPS-camera used includes a hybrid GPS system that uses accelerometers and a compass to improve location accuracy. Location and general location accuracy information was recorded in each photo’s EXIF data in a geographic coordinate system with a WGS 84 Datum. Location accuracy for this model of GPS-enabled camera is expected to be better than ± 10m (Kamada et al. 2013). Proper identification of the blooming

plants was ensured by referring to the USDA Plant Database (USDA, NRCS 2013) and by relying on the expert knowledge of the curator of the Clemson University Herbarium. The following tools were used to store photos and other information: Picasa 3, and Google Website (Google, Inc. 2010).

RESULTS

Temperature and precipitation. Precipitation in 1970, 2011 and 2012 was below the long-term (50 year) average (Table 2) and this combined with higher than average air temperature in 2011 and 2012 (Table 2) impacted drought severity (U.S. Drought Monitor at <http://drought.unl.edu>). Precipitation in 1971 was above average, but the average air temperature was comparable to the long-term average (Table 2) (CDIAC 2013).

Soil inventory results. There are thirteen soil series represented in this study area with Madison (MaE2; Fine, kaolinitic, thermic Typic Kanhapludults) being the predominant series at 28.7% (Table 3). Three soil orders are represented in this study area with Ultisols being the most abundant, then Inceptisols and Entisols. Lake Issaqueena has experienced significant environmental changes over the years, especially in terms of sedimentation in the northern part (Figure 1).

Project website. A project Google Website was developed and used for data display, organization and storage. Photos were uploaded in Picasa 3 and organized in web-albums. These albums were then uploaded into the Google Website and organized by date of collection. These photos are tagged with GPS coordinates and therefore could also be displayed in Google Earth. Photos of flowering plants for the phenological aspect of this study were organized by date and photos of the CVS plots within the plant communities (Figure 1; Table 1).

Plant inventory and phenological results. For the phenological results, the sampling times for both research periods included the whole year of study. In 1970–1971, plant inventory identified 269 blooming plant species along the shores of Lake Issaqueena (not including the surrounding area), which occurred within eight months (March–September) (Appendix 1). In 2011–2012, plant inventory identified 203 plant species that bloomed in 11 months (February–December) (Appendix 1). More than 80% of the photos taken showed the use of differential GPS correction with zero dilution of precision (DOP). Remaining photos where location was determined without differential GPS, reported a low DOP (typically <2.2). This indicates that photo location information should have been better than the $\pm 10\text{m}$ reported accuracy (Kamada et al. 2013). One hundred and forty-nine plant species (found in both inventories) were observed blooming in both 1970–1971 and 2011–2012 time periods (Appendix 1). There appears to be extension of the blooming period by three months (November, and December, February). Three blooming peaks (May, July, and September) were identified in the 1970–1971 data (Figure 2, Figure 3). Two blooming peaks (April and August) were identified in the 2011–2012 data (Figure 2, Figure 3).

Nineteen plant species found in both 1970–1971 and 2011–2012 plant inventories did not have changes in blooming months: *Amianthium muscitoxicum*, *Asclepias variegata*, *Bidens frondosa*, *Chamaecrista fasciculata*, *Clematis virginiana*, *Elephantopus carolinianus*, *Epigaea repens*, *Erythronium americanum*, *Gentianella quinquefolia*, *Goodyera pubescens*, *Leucanthemum vulgare*, *Lysimachia quadrifolia*, *Monotropa uniflora*, *Oxypolis rigidior*, *Sabatia angularis*, *Scutellaria elliptica*, *Spigelia marilandica*, *Thalictrum thalictroides*, and *Verbascum thapsus*. *Hypoxis hirsuta* was found in both 1970–1971 and 2011–2012 plant

Table 2. Monthly average temperature (T; °C) and monthly total precipitation (P; cm) and for 1970, 1971, 2011, 2012 and 50-year mean (Source: U.S. Historical Climatology Network—Monthly Data, Site 381770, Clemson University, South Carolina).

| Month | 1970 | | 1971 | | 2011 | | 2012 | | 50-year mean | |
|---------------|--------|--------|--------|--------|--------|--------|--------|--------|--------------|--------|
| | T (°C) | P (cm) | T (°C) | P (cm) | T (°C) | P (cm) | T (°C) | P (cm) | T (°C) | P (cm) |
| January | 2 | 6 | 6 | 12 | 4 | 5 | 9 | 11 | 5 | 13 |
| February | 7 | 9 | 7 | 17 | 9 | 11 | 9 | 5 | 7 | 12 |
| March | 11 | 10 | 9 | 16 | 12 | 16 | 17 | 6 | 11 | 14 |
| April | 17 | 9 | 16 | 9 | 18 | 9 | 18 | 6 | 16 | 10 |
| May | 21 | 7 | 19 | 10 | 21 | 5 | 22 | 8 | 20 | 10 |
| June | 25 | 4 | 25 | 10 | 26 | 12 | 24 | 16 | 24 | 10 |
| July | 27 | 6 | 25 | 17 | 28 | 5 | 27 | 12 | 26 | 11 |
| August | 26 | 18 | 25 | 12 | 27 | 2 | 25 | 21 | 25 | 12 |
| September | 25 | 4 | 24 | 10 | 22 | 10 | 22 | 6 | 22 | 10 |
| October | 18 | 15 | 19 | 16 | 15 | 4 | 16 | 7 | 16 | 10 |
| November | 10 | 4 | 10 | 16 | 12 | 11 | 10 | 2 | 11 | 10 |
| December | 9 | 8 | 11 | 15 | 9 | 10 | 9 | 13 | 7 | 12 |
| Total precip. | | 100 | | 159 | | 101 | | 112 | | 134 |
| Mean temp. | 16 | | 16 | | | 17 | 17 | | 16 | |

Table 3. Soils of the shores of Lake Issaqueena.

| Soil map unit name (map unit symbol) | Family or higher taxonomic classification |
|---|---|
| Chewacla soils, frequently flooded (Co) | Fine-loamy, mixed, active, thermic Fluvaquentic Dystrudepts |
| Hiwassee sandy loam, 10 to 25% slopes eroded (HwE2) | Very-fine, kaolinitic, thermic Rhodic Kanhapludults |
| Madison sandy loam, 10 to 25% slopes, eroded (MaE2) | Fine, kaolinitic, thermic Typic Kanhapludults |
| Pacolet fine sandy loam, 25 to 40% slopes (PaF) | Fine, kaolinitic, thermic Typic Kanhapludults |
| Pacolet fine sandy loam, 40 to 80% slopes (PaG) | Fine, kaolinitic, thermic Typic Kanhapludults |
| Rabun cobbly loam, 25 to 40% slopes (RaF) | Fine, kaolinitic, mesic Typic Kanhapludults |
| Sarr loam, 0 to 6% slopes (SrB) | Fine-loamy, mixed, semiactive, thermic Fluventic Dystrudepts |
| Toccoa soils (To) | Coarse-loamy, mixed, active, nonacid, thermic Typic Udifluvents |

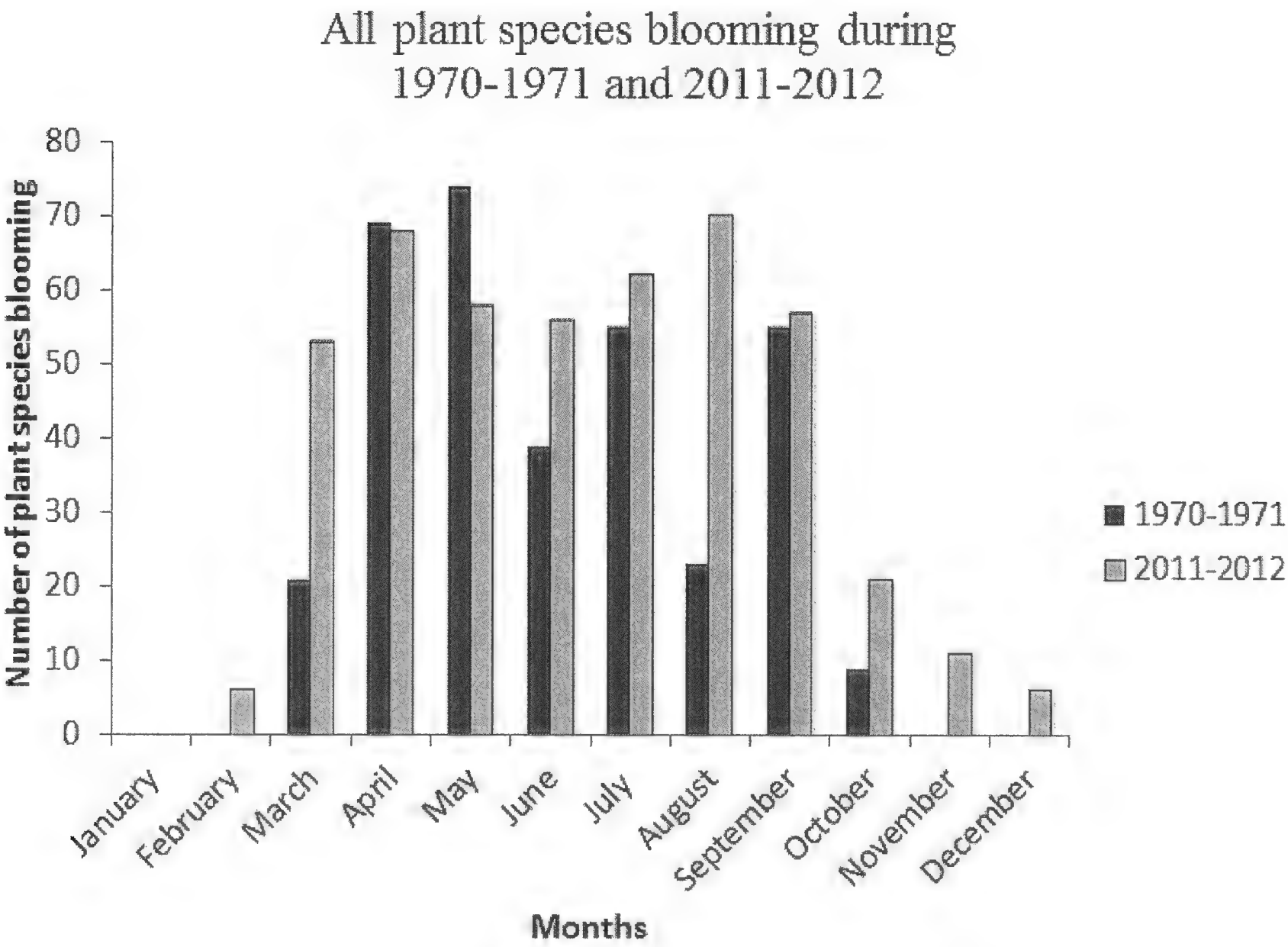


Fig. 2. Counts of all plants blooming during 1970–1971 (number of plants = 269) and 2011–2012 (number of plants = 203).

inventories and it bloomed the longest time (7 months) in 2011–2012. Figure 4 and Figure 5 show that plants in 1970–1971 survey bloomed for 1–2 months compared to a more spread out type blooming pattern for 2011–2012 with more plants having longer blooming periods extending to even 7 months of blooming.

The same plant species that bloomed during both
1970-1971 and 2011-2012

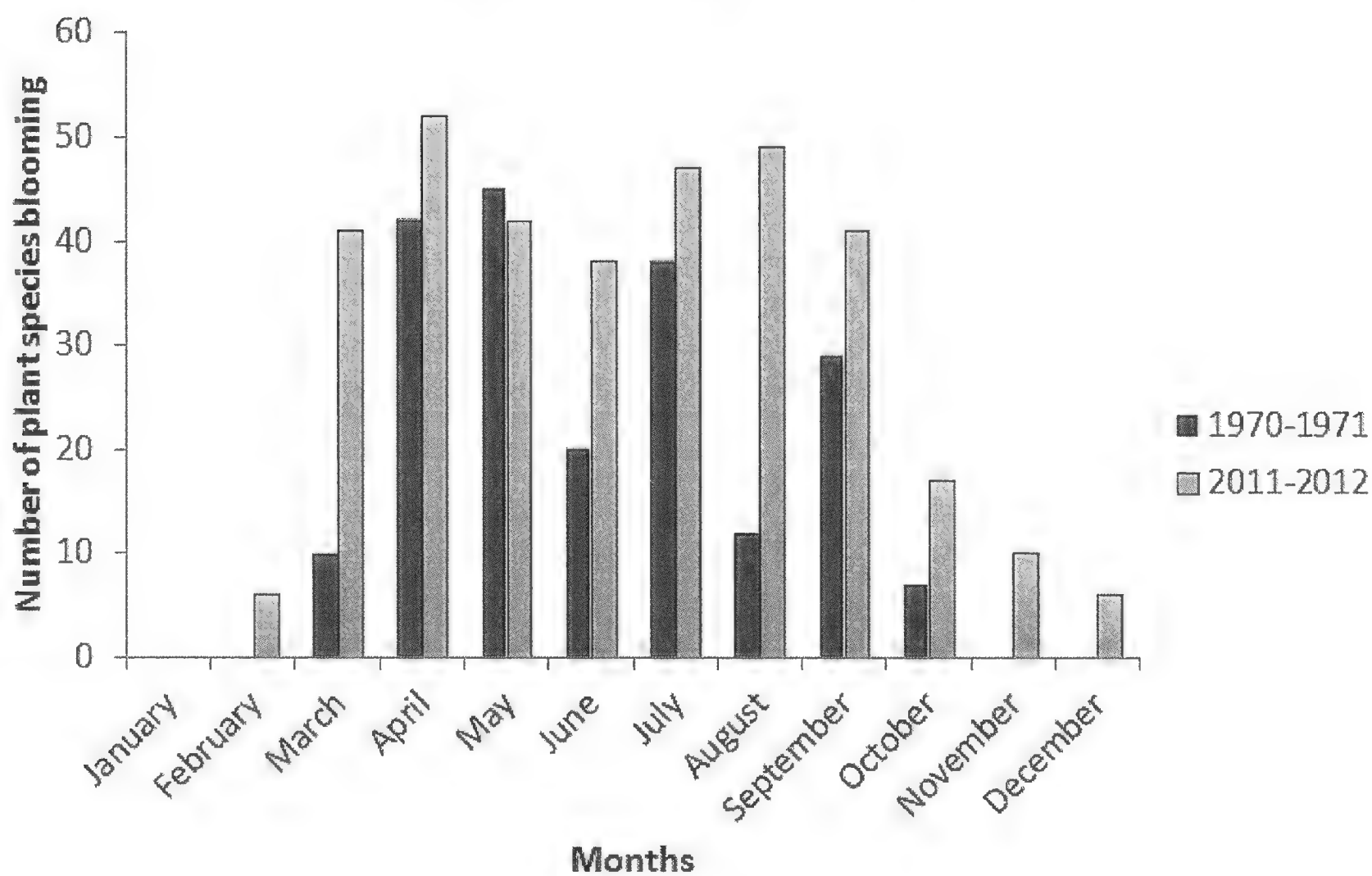


Fig. 3. Counts of same plant species that bloomed during both in both years 1970–1971 and 2011–2012 (number of plants in both years = 149).

Number of blooming months per plant

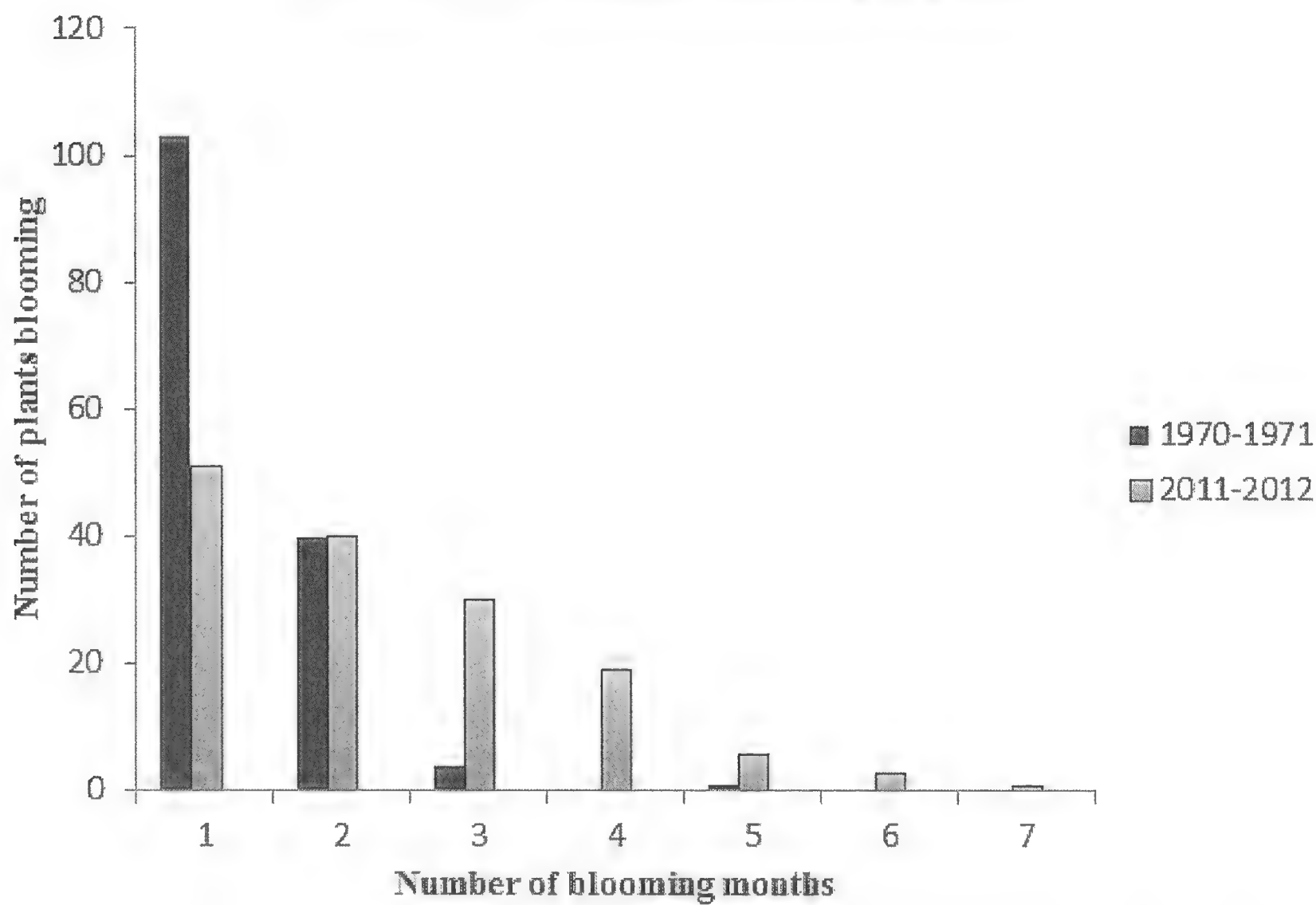


Fig. 4. Comparison of number of blooming months per plant in 1970–1971 and 2011–2012 (the same plant species that bloomed during both study periods, number of plants in both years = 149).

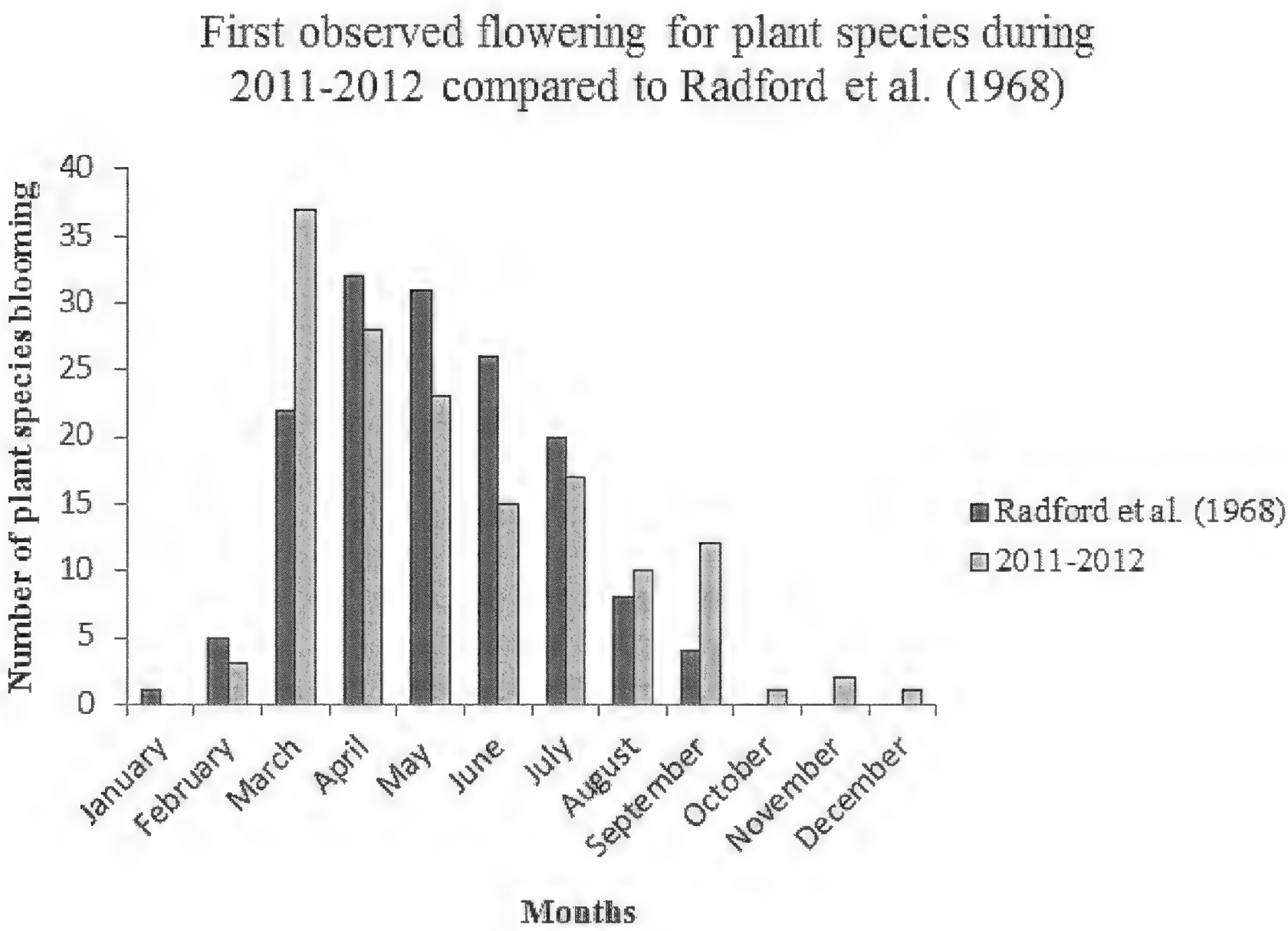


Fig. 5. Comparison of first observed flowering during 2011–2012 and Radford et al. (1968).

DISCUSSION

Integration of historic herbarium collections with modern field studies highlights the potential of leveraging these vast collections with global change research. Herbarium collections typically provide high-quality and well documented reference material to accurately understand climate change impacts, but limited research has been done on how to link this historical data to the present. Challenges include the limited location information of some herbarium samples, as they were typically collected before the GPS system was available. This study demonstrates the use of GPS-enabled digital cameras to record both the flowering state and location of plants over time. Exact location accuracy is not provided by the consumer-grade GPS camera used, but information on the use of GPS differential correction and estimated DOP are included with the recorded latitude and longitude. Having even a general location automatically recorded for each photo provides a historical record of flowering plant location within $\pm 10\text{m}$ meters or better. This is sufficiently accurate to identify flowering zones and may be useful to inform future studies. A professional-grade GPS with higher location accuracy would be preferable, but is often not realistic given the added time and expense of location recording. Crimmins and Crimmins (2008) study also found that digital photography could accurately document phenological events, but they did not use GPS-enabled cameras to build a spatial database which helps track changes over time and space. Google website avoids the cost and effort of custom website development, which may add extra features such as meteorological integration (Bradley et al. 2010), but must be maintained over time.

In 2011–2012, 203 plant species were observed compared to 269 plant species observed for the 1970–1971 research period. The smaller floristic inventory for the 2011–2012 plant inventory may be due to environmental changes within the area over the past 40 years.

The phenological data collected in the 2011–2012 research period was also compared with Radford et al. (1968) first blooming data for individual plant species of the Carolinas. There is an observable shift in blooming months when compared (Figure 5). The majority of plant species are observed to be blooming later and longer throughout the 2011–2012 research period when compared to Radford et al. (1968).

Natural history collections host a vast variety of biological specimens collected over time. These collections have received considerable long-term public support and it is essential to link these collections with current geospatial temporal environmental change research and education. Georeferencing natural history collection data is an important step in a process of building a spatial and temporal database, which connects this collection to other collections worldwide for use by researchers and educators.

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Appendix 1. Comparison between blooming in 1970-1971 (Symbol: •) and 2011-2012 (Symbol: ◊).

| Species | 1970-1971 | 2011-2012 | Both periods | J | F | M | A | M | J | J | A | S | O | N | D |
|---|-----------|-----------|--------------|---|---|-----|-----|-----|---|-----|---|-----|---|---|---|
| <i>Acer rubrum</i> | ✓ | ✓ | ✓ | | ◊ | • ◊ | | | | | | | | | |
| <i>Aconitum uncinatum</i> | ✓ | | | | | | | | | | | | • | | |
| <i>Actaea racemosa</i> var. <i>racemosa</i> | ✓ | ✓ | ✓ | | | | | ◊ | ◊ | • | | | | | |
| <i>Aesculus sylvatica</i> | ✓ | ✓ | ✓ | | | ◊ | • ◊ | | | | | | | | |
| <i>Agalinis purpurea</i> | | ✓ | | | | | | | | | | ◊ | | | |
| <i>Ageratina altissima</i> | ✓ | ✓ | ✓ | | | | | | | | ◊ | • ◊ | ◊ | ◊ | |
| <i>Ageratina aromatica</i> | ✓ | | | | | | | | | | | • | | | |
| <i>Agrimonia pubescens</i> | ✓ | ✓ | ✓ | | | | | | | • ◊ | ◊ | | | | |
| <i>Alnus serrulata</i> | ✓ | ✓ | ✓ | | ◊ | • | | | | | | | | | |
| <i>Allium cernuum</i> | | ✓ | | | | | | | | ◊ | ◊ | | | | |
| <i>Ambrosia artemisiifolia</i> | ✓ | | | | | | | | | | | • | | | |
| <i>Ambrosia trifida</i> | ✓ | | | | | | | | | | | • | | | |
| <i>Amelanchier arborea</i> | ✓ | | | | | • | | | | | | | | | |
| <i>Amianthium muscaetoxicum</i> | ✓ | ✓ | ✓ | | | | | • ◊ | | • ◊ | | | | | |
| <i>Amphicarpaea bracteata</i> | ✓ | ✓ | ✓ | | | | | | | | ◊ | • ◊ | | | |
| <i>Amsonia tabernaemontana</i> | ✓ | | | | | | • | | | | | | | | |
| <i>Anemone lancifolia</i> | ✓ | | | | | | • | | | | | | | | |
| <i>Anemone virginiana</i> | | ✓ | | | | | | | ◊ | | | | | | |
| <i>Angelica venenosa</i> | ✓ | | | | | | | | | • | | | | | |
| <i>Antennaria plantaginifolia</i> | ✓ | ✓ | ✓ | | | ◊ | • ◊ | | | | | | | | |
| <i>Antennaria solitaria</i> | ✓ | | | | | | • | | | | | | | | |
| <i>Apios americana</i> | ✓ | ✓ | ✓ | | | | | ◊ | ◊ | • | ◊ | • | | | |
| <i>Apocynum cannabinum</i> | ✓ | | | | | | | • | | | | | | | |
| <i>Arisaema triphyllum</i> | | ✓ | | | | | ◊ | ◊ | | | | | | | |

[illegible]

| Species | 1970–1971 | | | 2011–2012 | | | Both periods | | | J | F | M | A | M | J | J | A | S | O | N | D |
|--------------------------------|-----------|--|--|-----------|--|--|--------------|--|--|---|---|----|----|----|----|----|----|----|----|---|---|
| <i>Chamaelirium luteum</i> | ✓ | | | ✓ | | | ✓ | | | | | •◇ | • | | | | | | | | |
| <i>Chamaesyce maculata</i> | ✓ | | | | | | | | | | | | | | | | | • | | | |
| <i>Chelone glabra</i> | ✓ | | | ✓ | | | ✓ | | | | | | | | | | | ◇ | •◇ | | |
| <i>Chimaphila maculata</i> | ✓ | | | ✓ | | | ✓ | | | | | | | ◇ | •◇ | | | | | | |
| <i>Chionanthus virginicus</i> | ✓ | | | | | | | | | | | | • | | | | | | | | |
| <i>Chrysogonum virginianum</i> | ✓ | | | ✓ | | | ✓ | | | | ◇ | ◇ | •◇ | •◇ | | | | | | | |
| <i>Chrysopsis mariana</i> | ✓ | | | ✓ | | | ✓ | | | | | | | | | | ◇ | •◇ | ◇ | ◇ | ◇ |
| <i>Cicuta maculata</i> | | | | ✓ | | | | | | | | | | | ◇ | ◇ | ◇ | | | | |
| <i>Cirsium altissimum</i> | ✓ | | | | | | | | | | | | | | | | | • | | | |
| <i>Clematis viorna</i> | ✓ | | | ✓ | | | ✓ | | | | | | ◇ | • | • | | | | | | |
| <i>Clematis virginiana</i> | ✓ | | | ✓ | | | ✓ | | | | | | | | | | •◇ | | | | |
| <i>Clitoria mariana</i> | ✓ | | | ✓ | | | ✓ | | | | | | | ◇ | ◇ | •◇ | ◇ | | | | |
| <i>Collinsonia canadensis</i> | ✓ | | | | | | | | | | | | | | | | | • | | | |
| <i>Commelina communis</i> | | | | ✓ | | | | | | | | | | | | ◇ | ◇ | ◇ | | | |
| <i>Commelina virginica</i> | | | | ✓ | | | | | | | | | | | | | ◇ | | | | |
| <i>Coreopsis lanceolata</i> | | | | ✓ | | | | | | | | | ◇ | ◇ | | | | | | | |
| <i>Coreopsis major</i> | ✓ | | | ✓ | | | ✓ | | | | | | | ◇ | ◇ | •◇ | ◇ | ◇ | | | |
| <i>Cornus amomum</i> | ✓ | | | | | | | | | | | | | • | | | | | | | |
| <i>Cornus florida</i> | ✓ | | | ✓ | | | ✓ | | | | | | • | | | | | | | | |
| <i>Cornus foemina</i> | | | | ✓ | | | | | | | | | | | | | ◇ | | | | |
| <i>Corylus americana</i> | ✓ | | | | | | | | | | | • | | | | | | | | | |
| <i>Crataegus uniflora</i> | ✓ | | | | | | | | | | | | | • | | | | | | | |
| <i>Croptilon divaricatum</i> | ✓ | | | | | | | | | | | | | | | | | | | • | |
| <i>Crotalaria sagittalis</i> | ✓ | | | ✓ | | | ✓ | | | | | | | | ◇ | • | | | | | |

| Species | 1970–1971 | 2011–2012 | Both periods | J | F | M | A | M | J | J | A | S | O | N | D |
|----------------------------------|-----------|-----------|--------------|---|---|---|---|---|---|---|---|---|---|---|---|
| <i>Cuscuta compacta</i> | ✓ | | | | | | | | | • | | • | | | |
| <i>Cynoglossum virginianum</i> | ✓ | | | | | | • | • | | | | | | | |
| <i>Cypripedium acaule</i> | ✓ | | | | | | • | • | | | | | | | |
| <i>Cypripedium parviflorum</i> | ✓ | | | | | | | • | | | | | | | |
| <i>Daucus carota</i> | ✓ | | | | | | | • | • | • | | | | | |
| <i>Daucus pusillus</i> | ✓ | | | | | | | | | • | | | | | |
| <i>Decumaria barbara</i> | ✓ | | | | | | | • | | | | | | | |
| <i>Desmondium canescens</i> | ✓ | | | | | | | | | | | • | | | |
| <i>Desmodium nudiflorum</i> | | ✓ | | | | | | | ◇ | ◇ | ◇ | | | | |
| <i>Desmodium rotundifolium</i> | ✓ | ✓ | ✓ | | | | | ◇ | ◇ | | ◇ | • | | | |
| <i>Diodia teres</i> | ✓ | ✓ | ✓ | | | | | | | • | ◇ | | | | |
| <i>Diodia virginiana</i> | ✓ | ✓ | ✓ | | | | | ◇ | • | • | ◇ | ◇ | | | |
| <i>Dioscorea villosa</i> | ✓ | | | | | | | • | | | | | | | |
| <i>Doellingeria infirma</i> | ✓ | ✓ | ✓ | | | | | | ◇ | • | ◇ | | | | |
| <i>Duchesnea indica</i> | ✓ | | | | | • | | | | | | | | | |
| <i>Eclipta prostrata</i> | ✓ | | | | | | | | | | | • | | | |
| <i>Elephantopus carolinianus</i> | ✓ | ✓ | ✓ | | | | | | | | | ◇ | • | | |
| <i>Elephantopus tomentosus</i> | ✓ | ✓ | ✓ | | | | | | ◇ | | ◇ | • | ◇ | | |
| <i>Epifagus virginiana</i> | ✓ | ✓ | ✓ | | | | | | | | ◇ | • | ◇ | | ◇ |
| <i>Epigaea repens</i> | ✓ | ✓ | ✓ | | | • | ◇ | | | | | | | | |
| <i>Erigeron pulchellus</i> | ✓ | ✓ | ✓ | | | ◇ | • | | | | | | | | |
| <i>Erigeron strigosus</i> | ✓ | ✓ | ✓ | | | | | • | ◇ | • | ◇ | | | • | |
| <i>Erythronium americanum</i> | ✓ | ✓ | ✓ | | | • | | ◇ | | | | | | | |
| <i>Euonymus americanus</i> | ✓ | ✓ | ✓ | | | | ◇ | | | | | | | | |

| Species | 1970–1971 | 2011–2012 | Both periods | | J | F | M | A | M | J | J | A | S | O | N | D |
|---------------------------------|-----------|-----------|--------------|--|---|---|---|----|----|----|----|---|---|----|---|---|
| <i>Eupatorium album</i> | | ✓ | | | | | | | | ◇ | ◇ | ◇ | | | | |
| <i>Eupatorium capillifolium</i> | ✓ | | | | | | | | | | | | • | | | |
| <i>Euphorbia corollata</i> | ✓ | ✓ | ✓ | | | | | ◇ | •◇ | •◇ | •◇ | ◇ | ◇ | | | |
| <i>Eutrochium fistulosum</i> | ✓ | | | | | | | | | | | • | | | | |
| <i>Fagus grandifolia</i> | ✓ | ✓ | ✓ | | | ◇ | | • | | | | | | | | |
| <i>Fragaria virginiana</i> | ✓ | | | | | | | • | | | | | | | | |
| <i>Galax urceolata</i> | ✓ | ✓ | ✓ | | | | | ◇ | •◇ | | | | | | | |
| <i>Gentiana saponaria</i> | ✓ | ✓ | ✓ | | | | | | | | | | ◇ | •◇ | ◇ | ◇ |
| <i>Gentiana villosa</i> | | ✓ | | | | | | | | | | | ◇ | | | |
| <i>Gentianella quinquefolia</i> | ✓ | ✓ | ✓ | | | | | | | | | | | •◇ | | |
| <i>Geranium carolinianum</i> | ✓ | | | | | | | • | | | | | | | | |
| <i>Geranium maculatum</i> | ✓ | ✓ | ✓ | | | ◇ | | •◇ | • | | | | | | | |
| <i>Gillenia trifoliata</i> | ✓ | ✓ | ✓ | | | | | •◇ | • | | | | | | | |
| <i>Glycine max</i> | ✓ | | | | | | | | | | • | • | | | | |
| <i>Goodyera pubescens</i> | ✓ | ✓ | ✓ | | | | | | | ◇ | ◇ | | | | | |
| <i>Halesia carolina</i> | ✓ | | | | | | | • | | | | | | | | |
| <i>Halesia tetraptera</i> | | ✓ | | | | ◇ | | | | | | | | | | |
| <i>Helenium amarum</i> | ✓ | | | | | | | | | | | | • | | | |
| <i>Helianthus atrorubens</i> | ✓ | | | | | | | | • | | | | • | | | |
| <i>Helianthus decapetalus</i> | ✓ | | | | | | | | | | | • | | | | |
| <i>Helianthus divaricatus</i> | ✓ | | | | | | | | | | • | | | | | |
| <i>Helianthus hirsutus</i> | ✓ | | | | | | | | | | • | | | | | |
| <i>Helianthus strumosus</i> | ✓ | | | | | | | | | | | | • | | | |
| <i>Hemerocallis fulva</i> | ✓ | | | | | | | | | • | | | | | | |

| Species | 1970–1971 | 2011–2012 | Both periods | J | F | M | A | M | J | J | A | S | O | N | D |
|---------------------------------|-----------|-----------|--------------|---|---|---|----|---|----|----|---|----|---|---|---|
| <i>Mikania scandens</i> | | ✓ | | | | | | | | | ◇ | ◇ | | | |
| <i>Mimosa microphylla</i> | ✓ | ✓ | ✓ | | | | | ◇ | •◇ | •◇ | ◇ | | | | |
| <i>Mimulus ringens</i> | ✓ | ✓ | ✓ | | | | | | | •◇ | ◇ | • | | | |
| <i>Mitchella repens</i> | ✓ | ✓ | ✓ | | | | ◇ | • | | | | | | | |
| <i>Mollugo verticillata</i> | ✓ | | | | | | | | | • | | | | | |
| <i>Monotropa hypopithys</i> | ✓ | ✓ | ✓ | | | | | ◇ | | | | •◇ | | | |
| <i>Monotropa uniflora</i> | ✓ | ✓ | ✓ | | | | | | | | | •◇ | | | |
| <i>Nestronia umbellula</i> | ✓ | | | | | | | • | | | | | | | |
| <i>Nuphar lutea</i> | ✓ | ✓ | ✓ | | | ◇ | •◇ | | | ◇ | ◇ | ◇ | ◇ | | |
| <i>Nuttallanthus canadensis</i> | | ✓ | | | | ◇ | ◇ | | | | | | | | |
| <i>Obolaria virginica</i> | ✓ | | | | | • | • | | | | | | | | |
| <i>Oenothera biennis</i> | ✓ | | | | | | | | | • | | | | | |
| <i>Oenothera fruticosa</i> | ✓ | | | | | | | • | • | | | | | | |
| <i>Oenothera laciniosa</i> | ✓ | | | | | | • | | | | | | | | |
| <i>Onosmodium virginianum</i> | ✓ | | | | | | | • | | | | | | | |
| <i>Orbexilum onobrychis</i> | ✓ | | | | | | | | | | | • | | | |
| <i>Oxalis corniculata</i> | ✓ | | | | | | | | • | | | | | | |
| <i>Oxalis dillenii</i> | | ✓ | | | | ◇ | ◇ | ◇ | | | | | ◇ | ◇ | |
| <i>Oxalis stricta</i> | ✓ | ✓ | ✓ | | | ◇ | •◇ | | | | | | | | |
| <i>Oxalis violacea</i> | ✓ | ✓ | ✓ | | | ◇ | | • | | | ◇ | ◇ | | | |
| <i>Oxydendrum arboreum</i> | | ✓ | | | | | | | ◇ | | | | | | |
| <i>Oxypolis rigidior</i> | ✓ | ✓ | ✓ | | | | | | | | | •◇ | | | |
| <i>Packera anonyma</i> | ✓ | ✓ | ✓ | | | | ◇ | • | | | | | | | |
| <i>Passiflora incarnata</i> | ✓ | | | | | | | | | • | | | | | |

| Species | 1970–1971 | 2011–2012 | Both periods | J | F | M | A | M | J | J | A | S | O | N | D |
|---------------------------------|-----------|-----------|--------------|---|---|---|---|---|---|---|---|---|---|---|---|
| <i>Pedicularis canadensis</i> | ✓ | | | | | | • | | | | | | | | |
| <i>Peltandra virginica</i> | | ✓ | | | | | ◇ | ◇ | ◇ | | | | | | |
| <i>Penstemon australis</i> | ✓ | | | | | | | | • | | | | | | |
| <i>Penstemon digitalis</i> | | ✓ | | | | | | ◇ | | | | | | | |
| <i>Penstemon laevigatus</i> | ✓ | | | | | | | | • | | | | | | |
| <i>Phaseolus polystachios</i> | | ✓ | | | | | | ◇ | ◇ | | ◇ | | | | |
| <i>Phlox amoena</i> | ✓ | ✓ | ✓ | | | ◇ | • | • | | | | | | | |
| <i>Phlox glaberrima</i> | ✓ | | | | | | | | • | | | | | | |
| <i>Phlox carolina</i> | | ✓ | | | | | | ◇ | ◇ | ◇ | | | | | |
| <i>Phlox nivalis</i> | ✓ | | | | | • | • | | | | | | | | |
| <i>Phryma leptostachya</i> | ✓ | | | | | | | | | • | | | | | |
| <i>Physalis virginiana</i> | ✓ | ✓ | ✓ | | | | ◇ | • | | | ◇ | | | | |
| <i>Pityopsis graminifolia</i> | ✓ | ✓ | ✓ | | | | | | | ◇ | ◇ | • | ◇ | | |
| <i>Plantago virginica</i> | ✓ | | | | | | • | • | | | | | | | |
| <i>Platanthera clavellata</i> | ✓ | ✓ | ✓ | | | | | | | • | ◇ | | | | |
| <i>Podophyllum peltatum</i> | ✓ | ✓ | ✓ | | | ◇ | • | | | | | | | | |
| <i>Polygala senega</i> | ✓ | | | | | | • | | | | | | | | |
| <i>Polygonatum biflorum</i> | ✓ | ✓ | ✓ | | | | ◇ | • | | | | | | | |
| <i>Polygonum pennsylvanicum</i> | ✓ | ✓ | ✓ | | | | | | | | | • | • | ◇ | |
| <i>Polygonum sagittatum</i> | ✓ | ✓ | ✓ | | | | | | | ◇ | ◇ | • | ◇ | | |
| <i>Polygonum setaceum</i> | ✓ | ✓ | ✓ | | | | | | | | ◇ | • | | | |
| <i>Potentilla canadensis</i> | ✓ | ✓ | ✓ | | | ◇ | • | | | | | | | | |
| <i>Prunella vulgaris</i> | ✓ | ✓ | ✓ | | | | • | • | • | ◇ | • | ◇ | | | |
| <i>Prunus americana</i> | ✓ | | | | | | • | | | | | | | | |

| Species | 1970–1971 | | | 2011–2012 | | | Both periods | | | J | F | M | A | M | J | J | A | S | O | N | D |
|--------------------------------------|-----------|--|--|-----------|--|--|--------------|--|--|---|---|---|---|---|---|---|---|---|---|---|---|
| <i>Prunus dulcis</i> | ✓ | | | | | | | | | | • | | | | | | | | | | |
| <i>Prunus persica</i> | ✓ | | | | | | | | | | • | | | | | | | | | | |
| <i>Prunus serotina</i> | ✓ | | | | | | | | | | | • | | | | | | | | | |
| <i>Pseudognaphalium obtusifolium</i> | ✓ | | | ✓ | | | ✓ | | | | | | | | | | • | • | ◇ | | |
| <i>Pueraria montana</i> | ✓ | | | | | | | | | | | | | | | | • | | | | |
| <i>Pycnanthemum incanum</i> | | | | ✓ | | | | | | | | | | ◇ | | ◇ | ◇ | ◇ | | | |
| <i>Pycnanthemum montanum</i> | ✓ | | | | | | | | | | | | | | • | | | • | | | |
| <i>Pyrrhopappus carolinianus</i> | ✓ | | | | | | | | | | | | | | • | | | | | | |
| <i>Ranunculus acris</i> | | | | ✓ | | | | | | | ◇ | ◇ | | | | | | | | | |
| <i>Ranunculus hispidus</i> | ✓ | | | ✓ | | | ✓ | | | | ◇ | | • | | | | | | | | |
| <i>Rhexia mariana</i> | | | | ✓ | | | | | | | | | ◇ | | | ◇ | ◇ | | | | |
| <i>Rhexia virginica</i> | ✓ | | | ✓ | | | ✓ | | | | | | | ◇ | ◇ | ◇ | • | ◇ | | | |
| <i>Rhododendron arborescens</i> | ✓ | | | | | | | | | | | | | | • | | | | | | |
| <i>Rhododendron minus</i> | ✓ | | | ✓ | | | ✓ | | | | | ◇ | ◇ | • | | | | | ◇ | ◇ | ◇ |
| <i>Rhododendron periclymenoides</i> | ✓ | | | ✓ | | | ✓ | | | | ◇ | | • | | | | | | | | |
| <i>Rhus copallinum</i> | ✓ | | | | | | | | | | | | | | | • | | | | | |
| <i>Rhus glabra</i> | ✓ | | | | | | | | | | | | | | • | | | | | | |
| <i>Rosa multiflora</i> | ✓ | | | ✓ | | | ✓ | | | | | ◇ | ◇ | • | | | | | | | |
| <i>Rubus laudatus</i> | | | | ✓ | | | | | | | | ◇ | | | | | | | | | |
| <i>Rudbeckia fulgida</i> | ✓ | | | | | | | | | | | | | | | | | • | | | |
| <i>Rudbeckia hirta</i> | ✓ | | | ✓ | | | ✓ | | | | | ◇ | | ◇ | • | ◇ | | | ◇ | | |
| <i>Rudbeckia laciniata</i> | ✓ | | | | | | | | | | | | | | | • | | | | | |
| <i>Ruellia caroliniensis</i> | ✓ | | | ✓ | | | ✓ | | | | | ◇ | ◇ | ◇ | • | ◇ | | | | | |
| <i>Rumex crispus</i> | ✓ | | | | | | | | | | | | | • | | | | | | | |

| Species | 1970–1971 | | 2011–2012 | Both periods | | J | F | M | A | M | J | J | A | S | O | N | D |
|---|-----------|--|-----------|--------------|--|---|---|---|----|----|----|----|----|----|---|---|---|
| <i>Sabatia angularis</i> | ✓ | | ✓ | ✓ | | | ✓ | | | | | •◇ | | | | | |
| <i>Sagittaria latifolia</i> | | | ✓ | | | | | | | | | | ◇ | ◇ | | | |
| <i>Salix sericea</i> | ✓ | | | | | | | | • | | | | | | | | |
| <i>Salvia lyrata</i> | ✓ | | ✓ | ✓ | | | ◇ | | •◇ | • | | | | | | | |
| <i>Salvia urticifolia</i> | ✓ | | ✓ | ✓ | | | | | •◇ | • | | | | | | | |
| <i>Sambucus nigra</i> ssp. <i>canadensis</i> | ✓ | | | | | | | | | | • | | | | | | |
| <i>Sanicula canadensis</i> | | | ✓ | | | | | | ◇ | ◇ | ◇ | | | | | | |
| <i>Sanguinaria canadensis</i> | ✓ | | | | | | • | | • | | | | | | | | |
| <i>Scutellaria elliptica</i> | ✓ | | ✓ | ✓ | | | | | •◇ | •◇ | •◇ | | | | | | |
| <i>Scutellaria integrifolia</i> | | | ✓ | | | | | | ◇ | | ◇ | | | | | | |
| <i>Scutellaria lateriflora</i> | | | ✓ | | | | | | | | | | ◇ | | | | |
| <i>Senna obtusifolia</i> | ✓ | | ✓ | ✓ | | | | | | | | | •◇ | ◇ | ◇ | | |
| <i>Sericocarpus asteroides</i> | ✓ | | ✓ | ✓ | | | | | | ◇ | ◇ | •◇ | | | | | |
| <i>Sericocarpus linifolius</i> | ✓ | | | | | | | | | • | | | | | | | |
| <i>Silene stellata</i> | ✓ | | ✓ | ✓ | | | | | | ◇ | ◇ | ◇ | •◇ | ◇ | | | |
| <i>Silene virginica</i> | ✓ | | ✓ | ✓ | | | ◇ | | •◇ | ◇ | ◇ | | | | | | |
| <i>Silphium asteriscus</i> var. <i>laevicaule</i> | ✓ | | | | | | | | | | • | | | | | | |
| <i>Sisyrinchium angustifolium</i> | ✓ | | ✓ | ✓ | | | ◇ | | •◇ | •◇ | ◇ | | | | | | |
| <i>Sisyrinchium mucronatum</i> | ✓ | | | | | | | | • | | | | | | | | |
| <i>Smallanthus uvedalius</i> | ✓ | | ✓ | ✓ | | | | | | | | ◇ | ◇ | •◇ | | | |
| <i>Smilax herbacea</i> | ✓ | | | | | | | | | • | | | | | | | |
| <i>Smilax rotundifolia</i> | ✓ | | | | | | | | | • | | | | | | | |
| <i>Solanum americanum</i> | ✓ | | | | | | | | | | | | • | | | | |

| Species | 1970–1971 | | | 2011–2012 | | | Both periods | | | J | F | M | A | M | J | J | A | S | O | N | D |
|---|-----------|--|--|-----------|--|--|--------------|--|--|---|---|---|---|---|---|---|---|---|---|---|---|
| <i>Solanum carolinense</i> | ✓ | | | ✓ | | | ✓ | | | | | | ◇ | ◇ | • | ◇ | ◇ | ◇ | | | |
| <i>Solidago arguta</i> | ✓ | | | ✓ | | | ✓ | | | | | | | | ◇ | • | | | | | |
| <i>Solidago caesia</i> | ✓ | | | | | | | | | | | | | | | | | • | | | |
| <i>Solidago curtisii</i> | ✓ | | | | | | | | | | | | | | | | | • | | | |
| <i>Solidago erecta</i> | ✓ | | | ✓ | | | ✓ | | | | | | | ◇ | ◇ | | | • | | | |
| <i>Solidago odora</i> | ✓ | | | ✓ | | | ✓ | | | | | | | ◇ | ◇ | ◇ | ◇ | • | | | |
| <i>Spigelia marilandica</i> | ✓ | | | ✓ | | | ✓ | | | | | | ◇ | • | ◇ | • | | | | | |
| <i>Spiranthes lacera</i> var. <i>gracilis</i> | | | | ✓ | | | | | | | | | | ◇ | | | | | | | |
| <i>Staphylea trifolia</i> | ✓ | | | | | | | | | | | | • | | | | | | | | |
| <i>Stellaria pubera</i> | ✓ | | | ✓ | | | ✓ | | | | ◇ | | ◇ | | | | | | | | |
| <i>Stylosanthes biflora</i> | ✓ | | | ✓ | | | ✓ | | | | | | | ◇ | ◇ | • | ◇ | ◇ | | | |
| <i>Styrax grandifolius</i> | ✓ | | | ✓ | | | ✓ | | | | | | ◇ | • | | | | | | | |
| <i>Symphytotrichum cordifolium</i> | ✓ | | | | | | | | | | | | | | | | | • | | | |
| <i>Symphytotrichum patens</i> | | | | ✓ | | | | | | | | | | | | | | ◇ | ◇ | | |
| <i>Symphytotrichum pilosum</i> | ✓ | | | ✓ | | | ✓ | | | | | | | | | | | • | ◇ | ◇ | |
| <i>Symphytotrichum undulatum</i> | ✓ | | | ✓ | | | ✓ | | | | | | | | | | | • | ◇ | | |
| <i>Symplocos tinctoria</i> | ✓ | | | ✓ | | | ✓ | | | | ◇ | | • | | | | | | | | |
| <i>Tephrosia spicata</i> | ✓ | | | ✓ | | | ✓ | | | | | | | ◇ | ◇ | • | ◇ | | | | |
| <i>Tephrosia virginiana</i> | ✓ | | | ✓ | | | ✓ | | | | | • | ◇ | ◇ | | | | | | | |
| <i>Tipularia discolor</i> | | | | ✓ | | | | | | | | | | | | ◇ | ◇ | | | | |
| <i>Thalictrum pubescens</i> | | | | ✓ | | | | | | | | | | ◇ | ◇ | | | | | | |
| <i>Thalictrum thalictroides</i> | ✓ | | | ✓ | | | ✓ | | | | ◇ | • | ◇ | | | | | | | | |
| <i>Thaspium barbinode</i> | ✓ | | | ✓ | | | ✓ | | | | | | ◇ | • | | | | | | | |
| <i>Thaspium trifoliatum</i> | ✓ | | | | | | | | | | | | | • | | | | | | | |

| Species | 1970–1971 | | 2011–2012 | | Both periods | | J | F | M | A | M | J | J | A | S | O | N | D |
|----------------------------------|-----------|--|-----------|--|--------------|---|----|----|----|----|----|----|----|----|----|----|---|---|
| <i>Viola × palmata</i> | ✓ | | ✓ | | ✓ | | ◇ | ◇ | ◇ | • | • | | | | | | ◇ | ◇ |
| <i>Viola pedata</i> | ✓ | | | | | | | • | • | • | | | | | | | | |
| <i>Viola × primulifolia</i> | ✓ | | ✓ | | ✓ | | ◇ | ◇ | •◇ | | | | | | | | | |
| <i>Viola sororia</i> | | | ✓ | | | | ◇ | ◇ | ◇ | | | | | | | | | |
| <i>Viola triloba</i> | | | ✓ | | | | ◇ | | | | | | | | | | | |
| <i>Viola walteri</i> | ✓ | | ✓ | | ✓ | | ◇ | •◇ | ◇ | | | | | | | | ◇ | ◇ |
| <i>Vitis aestivalis</i> | ✓ | | | | | | | | | • | | | | | | | | |
| <i>Vitis rotundifolia</i> | ✓ | | | | | | | | | | | • | | | | | | |
| <i>Wisteria frutescens</i> | | | ✓ | | | | ◇ | | ◇ | | | | | | | | | |
| <i>Xanthorhiza simplicissima</i> | ✓ | | ✓ | | ✓ | | ◇ | ◇ | ◇ | • | | | | | | | | |
| <i>Yucca filamentosa</i> | ✓ | | | | | | | | | | | • | | | | | | |
| Total (1970–1971): | 269 | | | | 0 | 0 | 0 | 21 | 69 | 73 | 39 | 55 | 23 | 55 | 9 | 0 | 0 | 0 |
| Total (2011–2012): | | | 203 | | 0 | 6 | 53 | 68 | 57 | 56 | 62 | 70 | 57 | 21 | 10 | 6 | | |
| Total (both periods, 1970–1971): | | | | | 149 | 0 | 0 | 10 | 42 | 45 | 20 | 38 | 12 | 29 | 7 | 0 | 0 | 0 |
| Total (both periods, 2011–2012): | | | | | 149 | 0 | 6 | 41 | 52 | 42 | 38 | 47 | 49 | 41 | 17 | 10 | 6 | 6 |

NEWS AND NOTES

NEW PENNSYLVANIA COUNTY OCCURRENCES FOR *CARDAMINE IMPATIENS*, *GERANIUM DISSECTUM*, *LAMIASTRUM GALEOBDOLON*, *LATHYRUS LATIFOLIUS*, AND *ROSA GALLICA*

We report on the occurrence of three species in western Pennsylvania counties that represent state range extensions and two that represent new county occurrences. The range extension per se or new county occurrences for four of the species are important because of their respective invasive tendencies. The species for which new distribution data is available include *Cardamine impatiens* L., *Geranium dissectum* L., *Lamium galeobdolon* (L.) Ehrend. & Polatschek, *Lathyrus latifolius* L., and *Rosa gallica* L.

Cardamine impatiens may be confused with *C. hirsuta* L., *C. parviflora* L., *C. pennsylvanica* Muhl. and *Sibara virginica* (L.) Rollins. Although leaf, floral, or fruit characteristics can be used in combination to distinguish among the four *Cardamine* species, *C. impatiens* is most easily distinguished from the others by its cauline leaves with sagittate-auriculate bases and sharply toothed, sparsely ciliated leaflets. *Cardamine impatiens* differs from *S. virginica* in basic habit (erect and to 1 m tall, versus spreading and to 20 cm tall), silique shape (linear versus flattened respectively), and seed morphology (wingless versus winged respectively) (Cusick 1993; Glenn and Barringer 2004).

VOUCHER SPECIMENS: PENNSYLVANIA. BUTLER CO.: Vicinity of Lake Arthur, Big Run Road, in woodlands beside a culvert, 4 June 2012, *J. Chmielewski* 3221 (SLRO). **CRAWFORD CO.:** Hartstown Road, south of Linesville, vicinity of Pymatuning Reservoir near the spillway, woodland margin parallel to the abandoned railway, 11 June 2012, *J. Chmielewski* 3222 (SLRO); Hartstown Road, across from wildlife center, Linesville, damp depression among trees, 10 June 2012, *S.D. Lotz* 24 (SLRO).

Geranium dissectum is quite distinctive and it would be difficult to confuse it with any other species.

VOUCHER SPECIMENS: PENNSYLVANIA. CRAWFORD CO.: Hartstown Road, south of Linesville, vicinity of Pymatuning Reservoir near the spillway, open woods at the margin of the parking lot, 41° 39.023' N, 080° 25.028' W, 13 June 2013, *M. Saxion* 13 (SLRO); Meadville, Ernst Woods Bike Trail, just south of US 6/19 (Smock Hwy), along grassy woodland margin, 16 June 2013, *J. Chmielewski* 3231 (SLRO).

Although the numerous cultivars of *Lamium galeobdolon* at times exhibit subtle morphological differences their basic growth requirements and responses to habitat are similar. When in flower it is unlikely that the species would be confused with others. When only leaves are present the species may be confused with *Lamium maculatum* L., which also has whitish-mottled leaves but with the mottling along the mid-rib and not the margins.

VOUCHER SPECIMENS: PENNSYLVANIA. BUTLER CO.: Slippery Rock University campus, intersection of the road leading to the water tower and roadway that parallels right field at Wally Rose Field, woodland margin, 7 May 2012, *J. Chmielewski* 3220 (SLRO).

Non-flowering *Lathyrus latifolius* exhibits great affinity with both *L. hirsutus* L. and *L. odoratus* L. in that all three species have winged stems and compound leaves. The species differ in that *L. latifolius* is a perennial which produces 4-14 flowers per raceme, and has glabrous fruit, whereas both *L. hirsutus* and *L. odoratus* are annual-biennial, produce 1-3 flowers per raceme, and have pubescent fruit. The flowers of *L. latifolius* measure 1.9-2.5 cm across, whereas those of *L. hirsutus* are about 1.3 cm across. The flowers of *L. latifolius* are not fragrant but those of *L. odoratus* are (Fernald 1950; Rhoads and Block 2000, 2007). *Lathyrus latifolius* may also be confused with *L. japonicus* Willd., *L. ochroleucus* Hook., *L. palustris* L., and *L. venosus* Muhl. ex Willd. but the species are distinguishable by the fact that the latter four have 4-12 leaflets as opposed to two. Both *L. pratensis* L. and *L. tuberosus* L. differ from *L. latifolius* in that neither has winged stems. The flowers of *L. latifolius* measure about 2.5 cm in length but those of *L. sylvestris* L. are considerably smaller, measuring only 1.5 cm in length (Fernald 1950; Rhoads and Block 2000, 2007). *Lathyrus latifolius* and indeed all species of *Lathyrus* L. differ from species of *Pisum* L. in that the stipules of the latter are comparatively larger than in the former and more specifically, even larger than the basal leaflets per se. *Lathyrus latifolius* differs from species of *Vicia* L. by the fact that the former produces only two leaflets (Bailey 1949; Fernald 1950; Rhoads and Block 2000, 2007; Medley 2016).

VOUCHER SPECIMENS: PENNSYLVANIA. BUTLER CO.: Route 8, just north of Forestville, roadside embankment, 22 June 2013, *J. Chmielewski* 3225 (SLRO). Note: the species occurs on Route 8 at many roadside locations in Butler County between Butler and Barkeyville.

Rosa gallica differs from *R. × damascena* Mill. in that the latter species is larger, growing to 2.5 m, the leaves are serrate, but not glandular, and by the fact that the flowers occur in corymbs of 6-12. The weak, slender, recurved prickles of *R. gallica* can be used to differentiate the species from *Rosa rubiginosa* L. (syn. *R. eglanteria* L.) which has stout, recurved prickles. Additionally, the leaflets of *R. gallica* are considerably larger than are those of *R. rubiginosa* (Bailey 1949; Britton and Brown 1970).

VOUCHER SPECIMENS: PENNSYLVANIA. CRAWFORD CO.: Hartstown Road, north of PA 285, south of Linesville, road right of way along a woodland margin, 7 June 2013, *J. Chmielewski* 3224 (SLRO).

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The authors thank those students enrolled in the summer 2012 and 2013 offerings of Field Botany at the Pymatuning Laboratory of Ecology, who were sufficiently curious to ask about the identification of species which they had not previously encountered.

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JERRY G. CHMIELEWSKI, DAVID M. KRAYESKY, AND SAMUEL D. LOTZ, *Department of
Biology, Slippery Rock University*

Bayard Long Award for Botanical Research

The research project must advance our knowledge of plants that occur in the northeastern and mid-Atlantic region of the United States, especially the Philadelphia area. Specifically, the research project must include at least one plant species found in this region, although it can include additional plants not found in the region. (For example, a systematic botany project focusing on a genus with worldwide distribution but with one or more species occurring in the northeastern U.S. would be eligible.) For purposes of this award plants are as traditionally defined to include green plants as well as the plant-like organisms: lichens, fungi, and all groups of algae. We especially encourage applications on projects that focus on field work and/or herbarium work.

The award will generally be for approximately \$1000. Higher amounts will be considered depending on needs. The application deadline is December 15. Details on applying are available on the club's web site (www.philbotclub.org/long_award.html).

We are pleased to announce that the 2014 Bayard Long Award went to Marion Holmes, a graduate student at Ohio University. Ms. Holmes has provided a description of her research.

“I am finishing my fourth year as a PhD student in Dr. Glenn Matlack's lab at Ohio University. My research focuses of the effects of past land use history on forest plant communities. The majority of forest in Eastern North America has recolonized during the 20th century; much of it occupies land that was previously used for agriculture. Abandoned agricultural land has served as a model system for studying succession and community assembly because it is a widespread disturbance and readily available. Previous work has suggested contrasts in successional trajectories between cultivated and pastured lands, but this question has not yet been investigated in detail. My work aims to fill this gap by comparing community composition and development through time between the two land use histories. Different chapters will address tree community composition and structure, herb community composition, successional changes in the physical environment, development of spatial pattern in herb populations through time, and interactions of plant life history traits and land use history. In order to answer these questions, I travelled around Southeastern Ohio collecting a large amount of plant community and environmental data in a paired chronosequence of cultivated and pastured sites (40 sites, 400 plots total). The Bayard Long Award has supported to travel to field sites and acquisition of supplies to mark and locate plots. I am thankful to the Philadelphia Botanical Club for supporting my research and giving me the opportunity to share my work at a meeting.”

We are pleased to announce that the 2015 Bayard Long Award went to Max Piana, a graduate student at Rutgers, The State University of New Jersey. Mr. Piana has provided a description of his research

“It is an honor to receive the Bayard Long Award and I wish to thank the Philadelphia Botanical Club for supporting my research. I am a second year PhD student in the lab of Dr. Steven Handel and the Center for Urban Restoration Ecology at Rutgers University. My research

focuses on urban forest ecology, specifically native tree species recruitment and regeneration in forest fragments—a process critical to the long-term sustainability of these forests. Urban forests are thought to be recruitment limited, meaning establishment is constrained by either seed dispersal or site conditions. My research seeks to quantify this limitation and to identify specific ecological barriers and mechanisms limiting native plant regeneration. The Bayard Long Award will help support a segment of my doctoral research which includes experiments to test changes in forest seed rain quantity and composition given different disturbance conditions, management strategies, and landscape context. I will conduct my research in multiple forest fragments and parks located in the greater New York City metropolitan area. The results from this research will advance our understanding of how urbanization may impact forest ecosystem function and processes, and as a result, structure and composition. Ultimately, I hope this research will promote an urban forestry and planning paradigm that facilitates natural regeneration in forest fragments and parks throughout the mid-Atlantic region.”

2014 FIELD TRIPS

Reports reviewed, formatted, and edited by TED GORDON. The assistance of Chris Hoess and Gerry Moore is gratefully acknowledged.

12 January (Sunday): Bull's Island State Park, Stockton, Hunterdon County, NJ.

The field trip was planned as an introduction to winter field identification. The use of common names was promised. The hope was to generate interest among beginners in general and to attract younger people in particular to attend PBC field trips. It was not very successful in the latter, somewhat more so, in the former. No species list was made since it was well known what species would be seen on Bull's Island in winter. The challenge was making correct identifications in the dead of winter. In this, the day was a great success. It was most worthwhile puzzling over bark, twigs and buds until a consensus was reached and the identification became obvious. We left nothing unidentified.

There were two highlights for the day. Near the entrance to Bull's Island State Park, a large evergreen tree turned out to be a Douglas fir (*Pseudotsuga menziesii*), far from its native Rocky Mountains and Pacific coast home. The tree was identified by its distinctive cones bearing 3-pronged bracts projecting from each cone scale. How it came to be so far from home and in that spot both remain mysteries. We finished the day searching for a known population of three-leaved hop tree or waver-ash (*Ptelea trifoliata*) and were only successful in finding one small tree not more than ten feet tall. We searched unsuccessfully for a healthier population.

The goal remains to come up with ways to create new interest in field botany, and the leader encourages further efforts to this end.

Attendance 11. **Report by leader: David Austin**

29 March (Saturday): Haddington Woods (formerly Bocce Woods), Cobbs Creek Park, Philadelphia, PA.

Because of inclement weather, David Hewitt's trip was postponed to April 20.

19 April (Saturday): Shenk's Ferry Wildflower Preserve, Lancaster County, PA.

Trip sponsored jointly by the Muhlenberg Botanical Society.

This glen, owned by the Lancaster County Conservancy, is adjacent to the Susquehanna River. It is one of the most floristically abundant and diverse areas in the valley. Most of the glen is on rich limestone soil derived from the Conestoga Formation.

We saw a spectacular display of *Mertensia virginica* and the 'Susquehanna trillium'. The trilliums are very variable with intergrading characteristics of *Trillium cernuum* and *T. erectum*. It may be a hybrid swarm or an example of incomplete speciation. These trilliums occur at several locations along the lower Susquehanna River in Pennsylvania and Maryland.

The following were among the many other species we observed: *Anemone americana* (= *Hepatica nobilis* var. *acuta*), *Aplectrum hyemale*, *Aquilegia canadensis*, *Boechera laevigata* (= *Arabis laevigata*), *Arabidopsis lyrata* spp. *lyrata* (= *Arabis lyrata*), *Asarum canadense*, *Cardamine concatenata*, *Carex albursina*, *C. blanda*, *C. conjuncta*, *C. jamesii*, *Caulophyllum thalictroides*, *Claytonia virginica*, *Corydalis flavula*, *Dicentra canadensis*, *D. cucullaria*,

Erythronium albidum, *E. americanum*, *Galearis spectabilis*, *Geranium maculatum*, *Hybanthus concolor*, *Hydrastis canadensis*, *Hydrophyllum canadense*, *H. virginianum*, *Maianthemum racemosum* (= *Smilacina racemosa*), *Mitella diphylla*, *Osmorhiza claytonia*, *O. longistylis*, *Packera aurea*, *Phlox divaricata*, *Poa cuspidata*, *Podophyllum peltatum*, *Polygonatum biflorum* var. *biflorum*, *Polymnia canadensis*, *Sanguinaria canadensis*, *Micranthes virginensis* (= *Saxifraga virginensis*), *Sedum ternatum*, *Viola labradorica*, *V. pubescens*, *V. sororia*, *V. striata*, *Euonymus atropurpureus*, *Hydrangea arborescens*, *Staphylea trifolia*, *Asplenium platyneuron*, *A. rhizophyllum*, *Cystopteris protrusa*, *C. tenuis*, *Pellaea atropurpurea*, and *Polystichum acrostichoides*.

Attendance: 20. Report by leaders: Joan King and Tim Draude.

20 April (Sunday): Haddington Woods, Cobbs Creek Park, Philadelphia, PA.

This site includes several distinct communities: 1) seeps; 2) a former quarry (presently a wetland); 3) an approximately 100-years-old stand that is transitioning from early successional (tulip poplar) to oak-hickory and includes a regenerating understory of oak and hickory saplings; 4) a younger stand, approximately 70 years old or less, of a type commonly found in urban parks with a recent history of disturbance and arrested succession; 5) a floodplain habitat, a reconstructed wetland dating to late 1990s; and 6) an upland alder stand.

We saw a flowering redbud (*Cercis canadensis*) to the north as we walked in, just prior to getting to the quarry, near the entrance from the Bocce Court parking lot (entrance at 66th and Vine Streets). We also saw quite a bit of lesser celandine (*Ficaria verna* = *Ranunculus ficaria*) on the ground as we entered, and at multiple other sites throughout the locality.

By the quarry itself, we saw spicebush (*Lindera benzoin*) in flower, Japanese honeysuckle (*Lonicera japonica*) leafed out and trailing on the ground, and buckeye (*Aesculus* sp.), also in leaf, and some larger trees with expanding flower buds, throughout the plain around the water in the quarry (the water was about 2 or 3 feet deep). In the quarry, we also saw box elder (*Acer negundo*) in leaf, some right at the edge of the water, bird cherry (*Prunus padus*) in flower, jumpseed (*Persicaria virginiana* = *Polygonum virginianum*) leaves flat against the ground, a large (~2' dbh) black locust (*Gleditsia triacanthos*), chickweed (*Stellaria media*) in flower, and mayapple (*Podophyllum peltatum*). It was noted that there was no *Cystopteris* growing on the quarry's rock walls. The location of a former spring, which flowed until the 1960s, was pointed out near the ground at the north wall of the quarry.

Near the regenerating woods, there was a redbud in bloom and bloodroot (*Sanguinaria canadensis*) in fruit. One individual of bloodroot was in flower. Poison ivy (*Toxicodendron radicans*) was leafing out around an uncovered sewer entry. We saw only one species of fern, a few fronds of Christmas fern (*Polystichum acrostichoides*).

In the regenerating woods, poison ivy, tulip poplar (*Liriodendron tulipifera*) saplings (<1" dbh), white oak (*Quercus alba*) saplings (<1" dbh) were all leafing out, and buds of hickory (*Carya* sp.) were just opening. The canopy was red oak (*Quercus rubra*) dominant.

Downhill from the regenerating woods toward Cobbs Creek, there was a patch with a Solomon's Seal (*Polygonatum* sp.), a violet (*Viola* sp.), Christmas fern, jumpseed, wild geranium (*Geranium maculatum*) in leaf but not in flower, and lesser celandine.

In the wetlands restoration site near Cobbs Creek (this restoration dates to the late 1990s), there was more lesser celandine and chickweed. Uphill from there we saw golden ragwort (*Packera aurea* = *Senecio aureus*), and further uphill from the more recent wetland restoration, we heard a blue-gray gnatcatcher (*Polioptila caerulea*).

Added to the above list, courtesy of Sean Solomon, were spring beauty (*Claytonia virginica*), false Solomon's seal (*Maianthemum racemosum* = *Smilacina racemosa*), Solomon's seal (*Polygonatum biflorum* var. *biflorum*), mayapple, bloodroot, and Jacob's ladder (*Polemonium reptans*).

Ken Frank noted, "A striking finding was the complete absence of honeybees. Ordinarily, honeybees emerge abundantly early in the spring because, unlike bumblebees, the whole colony (not just the queen) overwinters. Usually, bumblebees early in the spring are rare compared to honeybees. I was on the alert for honeybees, but saw none, despite plentiful carpenter bees, bumblebees, and smaller bees which I could not identify."

Report by leader: David Hewitt.

26 April (Saturday). Sharptown, Quinton, Pine Mount, Cumberland and Salem Counties, NJ. Joint Trip with the Torrey Botanical Society.

This trip began south southwest of Sharptown, along the Major Run tributary of the Salem River. Here the group botanized in rich streamside woodlands to see stands of the state-endangered (S1) *Polemonium reptans* just coming into bloom. A small population of *Asarum canadense* was also noted in bloom. *A. canadense* is exceedingly rare in southern New Jersey. It was noted by the leader that in the early and mid-1900s, the species was collected along Major Run by Bayard Long and John Fogg Jr., herbarium curators at the Academy of Natural Sciences of Philadelphia. Curiously, there are no historical or current records for *A. canadense* from woodlands along the Salem River even though the same soil type (Bibb silt loam) and many of the same associated species, like *P. reptans*, are present there. The group then headed north to Sharptown and botanized similar woodlands along the Salem River to see larger stands of *P. reptans*. Other species noted in bloom or coming into bloom included *Arisaema triphyllum*, *Cardamine concatenata*, *C. pennsylvanica*, *Claytonia virginica*, *Erythronium virginicum*, *Maianthemum racemosum*, *Podophyllum peltatum*, *Polygonatum biflorum*, *Uvularia sessilifolia*, *Viola affinis*, *V. cucullata*, and *V. pubescens*. A few blooming individuals of *Dicentra cucullaria*, an exceptionally rare species in southern New Jersey, were observed as well. The basal leaves of *Allium triococcum* were noted in a few places. These rich woodlands also supported large stands of invasive species, most notably *Alliaria petiolata*, *Microstegium vimineum*, and *Ranunculus ficaria* (= *Ficaria verna*).

The group then traveled to the Mannington area, where a quick stop was made to see a population of *Caltha palustris* in late bloom. The next stop was Quinton, where in Muttontown Woods *Sanguinaria canadensis* (mostly past bloom) was observed. Most of the common spring wildflowers observed at Sharptown were also noted here. Other species found included *Anemone quinquefolia*, *Luzula echinata*, *Ranunculus recurvatus*, and *Smilax pulverulenta*, the last rare (S3) in New Jersey. The group then traveled to a nearby Atlantic white cedar swamp to see a fine population of the federally-threatened *Helonias bullata* in bloom. The flowers were at peak fragrance, their sweet odor obvious in the air. In the uplands woods adjacent to the swamp, several distinctive nests were observed in the trees. The nests appeared in the forks of branches near the trunks. It was later determined that these were likely the summer nests (dreys) of red squirrels.

The group's last stop of the day was Pine Mount (Mount Gibbon), in Greenwich Twp., Cumberland County. George Hammell Cook (1818–1889), New Jersey State Geologist (1864–1889) wrote the following about Pine Mount (Ann. Rep. State Geol. 1880: 94. 1880): "Pine Mount is a very remarkable ridge ... Its very steeply sloping surface and its

narrow crest, only 50 feet wide, makes it a prominent object of the landscape and a puzzle to geologists.” Pine Mount appears to be part of a ridgeline that includes the unnamed hills between Hell Neck Road and Buck Horn Rd. (Lower Alloways Creek Twp., Salem Co.), Coffin Hill (below Pecks Corner, Quinton Twp., Salem Co.), Burden Hill, and Big Mannington Hill (Mannington Twp., Salem Co.). Previous excursions (see Moore in *Bartonia* 63: 63–64. 2006) in this area were limited to roadside botany, the hill itself being inaccessible as it is on private property. However, permission had been obtained to visit Pine Mount proper, as well as the adjacent open wetland (former cranberry bog according to old maps). It was too early in the year to botanize the open wetland, it being largely devoid of vegetation. However, a small stand of mature *Taxodium distichum* with numerous “knees” was noted. The upland woods along the slopes of Pine Mount were comprised of a mixture of oaks [*Quercus alba*, *Q. falcata*, *Q. ilicifolia*, *Q. marilandica*, *Q. montana* (most abundant species), *Q. phellos*, *Q. stellata*, *Q. velutina*] and pines (*Pinus echinata*, *P. rigida*, *P. virginiana*). A diseased specimen of *Castanea dentata* was noted. The shrub layer consisted chiefly of *Gaylussacia baccata*, *G. frondosa*, *Leucothoe racemosa* (= *Eubotrys racemosa*), *Morella pensylvanica*, and *Vaccinium pallidum*. In open areas were good stands of *Hudsonia ericoides*, a species that is only infrequently encountered in western Cumberland County where it is usually associated with cuestas. At the top of the hill there was much exposed stone and gravel, the hill having been mined for these materials. Prior to mining, the hill may have been the highest point in the county, old maps showing its summit as high as 150 feet. Besides the native pine species, there were also planted stands of *Pinus resinosa* and *P. sylvestris*. Primarily a species of Canada and the eastern U.S., *P. resinosa* is state endangered, with native New Jersey populations currently known only from Sussex County. *P. sylvestris* is native to Asia and Europe and is naturalized in the U.S. Also noted here was a large stand of *Poterium sanguisorba* (= *Sanguisorba minor*), a non-native species that had previously not been reported from Cumberland County.

Attendance: 8. Report by leader: Gerry Moore.

03–04 May (Saturday, Sunday): “Little Cove” and Shippensburg Area, Franklin, Cumberland, and Adams Counties, PA.

The group explored the rich, mostly calcareous flora on the floodplain and mesic to xeric, wooded slopes along SR 456 and Red Rock Road, north of Licking Creek. Native species in bloom included *Trillium sessile*, *Poa cuspidata*, *Asarum canadense*, *Delphinium tricornis*, *Ranunculus hispidus*, *R. micranthus*, *Thalictrum dioicum*, *T. thalictroides*, *Corydalis flavula*, *Dicentra cucullata*, *Cercis canadensis*, *Viola bicolor*, *V. pedata*, *V. pubescens* var. *scabriuscula* (= *V. pensylvanica*), *V. sororia*, *V. striata*, *Geranium maculatum*, *Staphylea trifolia*, *Cardamine pensylvanica*, *Floerkea proserpinacoides*, *Claytonia virginica*, *Cornus florida*, *Phlox divaricata*, *Galium aparine*, *Mertensia virginica*, *Antennaria plantaginifolia*, *Packera aurea* (= *Senecio aureus*), *Chaerophyllum procumbens*, and *Taenidia integerrima*. Of special interest was *Primula meadia* (= *Dodecatheon meadia*), one of the populations morphologically intermediate between *P. meadia* and *P. fassettii* (= *D. amethystinum*).

Additional native species of interest but past blooming, in immature fruit, included *Erythronium americanum*, *Carex albursina*, *Anemone americana* (= *Hepatica nobilis* var. *obtusata*), *Jeffersonia diphylla* (large patches), *Sanguinaria canadensis*, *Micranthes virginiana* (= *Saxifraga virginiana*), and *Cardamine concatenata* (= *Dentaria laciniata*). Additional native species not yet blooming included *Dioscorea quaternata*, *Allium tricoccum*, *Maianthemum racemosum* (= *Smilacina racemosa*), *Polygonatum biflorum*, *Agrimonia rostellata*, *Celtis*

tenuifolia, *Ptelea trifoliata* (crooked shrubs, still dormant, with last year's fruits), *Opuntia humifusa*, *Galium concinnum*, *Cynoglossum virginianum*, *Hydrophyllum macrophyllum*, *H. virginianum*, *Phacelia purshii*, *Monarda clinopodia*, *Erigeron pulchellus*, *Hieracium venosum*, *Packera obovata* (= *Senecio obovatus*), *Silphium trifoliatum*, *Symphotrichum shortii*, *Heracleum maximum*, *Thaspium barbinode*, *Zizia aptera*, *Viburnum acerifolium*, and *V. prunifolium*. Ferns included *Botrychium virginianum* (= *Botrypus virginianus*), *Asplenium platyneuron*, *Woodsia obtusa*, and *Polystichum acrostichoides*. Not found in their expected locations were *Euphorbia commutata* and *Phacelia dubia*, both of which had been observed on the previous field trip to this site on April 23, 2011. Also not found were the single-plant occurrences of *Lithospermum canescens* and *Chrysogonum virginianum*, which the leader had not seen in many years. Viewed at a distance were *Hylotelephium telephioides* (= *Sedum telephioides*) on the spectacular rock outcrop on the south bank of Licking Creek, along with *Aquilegia canadensis* and *Polypodium virginianum* (complex).

Finally the group briefly visited the steep, northwest-facing limestone bluffs on the south side of Licking Creek, just south of the Maryland border. This section provided closer views of *Hylotelephium telephioides*, plus *Carex platyphylla*, *Mitella diphylla*, *Arabidopsis lyrata* (= *Arabis lyrata*), *Boechera laevigata* (= *Arabis laevigata*) [*B. burkii* should be sought on future field trips], *Galium boreale*, and several ferns including *Adiantum pedatum*, *Cystopteris tenuis*, *Dryopteris marginalis*, *Pellaea atropurpurea*, *Asplenium rhizophyllum*, and abundant *A. trichomanes*. Not observed were the few plants of *A. resiliens* that had been noted on the field trip in 2011.

On Sunday morning, May 4, some members of the group visited additional sites in Franklin and Cumberland counties. The first was a large seasonal pond, Mountain Run Pond, owned by The Nature Conservancy, with a large population of *Orontium aquaticum* in peak bloom. Next was the powerline clearing at the intersection of SR 233 and the Shippensburg-Arendtsville Road to observe *Iris verna*, not yet in bloom, plus four species of lycopods: *Dendrolycopodium hickeyi*, *Diphasiastrum digitatum*, *D. tristachyum*, and *Lycopodium clavatum*. The final stop was just east of Fuller Lake in Pine Grove Furnace State Park, Cumberland County, to view a pre-blooming population of *Trillium cernuum*.

Species list by Larry Klotz and David Lauer.

Attendance: 12. Report by leader: Larry Klotz.

O7–11 May (Wednesday–Sunday): The Historic National Beagle Club Institute Farm, Aldie, Virginia. The Annual Joint Field Meeting of the Northeast Section of the Botanical Society of America, the Torrey Botanical Society, and the Philadelphia Botanical Club, hosted by the Piedmont Chapter of the Virginia Native Plant Society (VNPS).

We spent **Thursday** walking the Chain Bridge Flats along the Potomac River, led by Natural Resource Specialist and excellent botanist, Rod Simmons. This area offers flood-scoured Piedmont bedrock-terrace habitat with unusual flora and vegetation, including several Midwestern disjuncts. Some particularly notable plants were *Phacelia covillei*, *Arabidopsis lyrata* (= *Arabis lyrata*), *Ptelea trifoliata*, and amazingly extensive stands of *Opuntia humifusa*. Some other species were *Acer negundo*, *Asimina triloba*, *Betula nigra*, *Cardamine angustata*, *Carya glabra*, *C. ovalis*, *C. tomentosa*, *Celtis occidentalis*, *Cerastium arvense*, *C. velutinum* var. *velutinum*, *Cercis canadensis*, *Chionanthus virginicus*, *Chrysogonum virginianum*, *Claytonia virginica*, *Cornus florida*, *Fraxinus americana*, *F. pennsylvanica*, *Ilex decidua*, *Krigia virginica*, *Lonicera maackii*, *Mertensia virginica*,

Nyssa sylvatica, *Oxalis violacea*, *Paulownia tomentosa*, *Phlox divaricata*, *Pinus virginiana*, *Populus deltoides*, *Quercus alba*, *Q. palustris*, *Q. phellos*, *Q. montana*, *Q. rubra*, *Q. stellata*, *Sassafras albidum*, *Silene caroliniana*, *Stellaria pubera*, *Toxicodendron radicans*, *Ulmus americana*, *Vaccinium fuscatum*, *Viburnum prunifolium*, and *Woodsia ilvensis*.

Brent Steury, Natural Resources Manager of the George Washington Memorial Parkway, gave the evening talk on “Biodiversity in the George Washington Memorial Parkway” highlighting this diverse plant community and the factors that have contributed to this diversity of both native and non-native plants.

On Friday, we visited the George W. Thompson State Wildlife Management Area. VNPS has designated this area as a Native Plant Registry Site to help preserve the tremendous variety of native plants. The rich but very rocky soil produced ideal conditions for the growth of wildflowers and discouraged plowing in the last few centuries. Though logged at least once, the Registry designation helped prevent further logging in recent decades. VNPS’s removal of invasive plants, such as *Alliaria petiolata*, has also helped prevent their spread and crowding out of native plants. *Trillium grandiflorum* carpeted the forest floor, with some flowers pink even when they first opened. Some species observed were: *Anemonella thalictroides*, *Arisaema triphyllum*, *Asarum canadense*, *Asimina triloba*, *Barbarea vulgaris*, *Botrychium virginianum* (= *Botrypus virginianus*), *Cardamine angustata*, *C. concatenata* (= *Dentaria laciniata*), *Cerastium arvense*, *Cercis canadensis*, *Chrysosplenium americanum*, *Cornus florida*, *Corydalis flavula*, *Cypripedium parviflorum*, *Galearis spectabilis*, *Geranium maculatum*, *Hybanthus concolor*, *Hydrangea arborescens*, *Liriodendron tulipifera*, *Micranthes pensylvanica*, *Obolaria virginica*, *Podophyllum peltatum*, *Ranunculus abortivus*, *Sanguinaria canadensis* (still in bloom!), *Stellaria pubera*, *Thalictrum dioicum*, *T. thalictroides* (= *Anemonella thalictroides*), *Trillium grandiflorum* (pink), *Tussilago farfara*, *Viola palmata*, *V. pubescens*, and *V. sororia* (= *V. papilionacea*).

Our evening speaker, Marion Lobstein, Emeritus Professor of Northern Virginia Community College, presented her program “Planning and funding a state flora, with special reference to the new *Flora of Virginia*.” Marion was a key player at all stages of the production of this flora, from start to completion, and continues to offer seminars to introduce local botanists to the *Flora*. Before its publication in 2012, one needed floras of West Virginia and North Carolina in addition to northeastern North America to cover all of the plants in the state. She described the *Flora* and explained how the project was carried out, providing some inspiration and ideas for anyone thinking of doing a flora of their state.

Saturday’s trip involved a somewhat strenuous hike to a spectacular rock cliff on the west side of Wildcat Mountain, a metabasalt breccia outcrop where we stopped for lunch and botanizing. This area is a Nature Conservancy Natural area, to protect its unique flora and vegetation. An expert on the area, Gary Fleming, Vegetation Ecologist, Virginia Natural Heritage Program, led the trip, with the assistance of local landowner and botanist Jocelyn Sladen. A few species were: *Acer rubrum*, *Botrychium matricariifolium*, *Botrychium virginianum*, *Cardamine concatenata*, *Carya ovalis*, *Celtis tenuifolia*, *Cerastium arvense*, *Cercis canadensis*, *Chionanthus virginicus*, *Clematis ochroleuca*, *Comandra umbellata*, *Corydalis sempervirens*, *Crataegus macrosperma*, *Dioscorea villosa*, *Galearis spectabilis*, *Gaylussacia baccata*, *Hydrangea arborescens*, *Lindera benzoin*, *Liriodendron tulipifera*, *Micranthes virginensis* (= *Saxifraga virginensis*), *Obolaria virginica*, *Ophioglossum pycnostichum* (= *O. vulgatum*), *Oxalis violacea*, *Phegopteris hexagonoptera* (= *Thelypteris hexagonoptera*), *Pinus virginiana*, *Polygonatum biflorum*, *Polypodium virginianum*, *Quercus alba*, *Q. montana*, *Q. rubra*, *Rhododendron periclymenoides*, *Rubus flagellaris*,

Silene caroliniana, *Smilax rotundifolia*, *Stellaria pubera*, *Taenidia integerrima*, *Trillium grandiflorum*, *Uvularia perfoliata*, *Viola palmata*, and *V. pedata*.

We ended the day with a talk by historical ecologist, Emily Southgate, Adjunct Professor at Hood College on “What the Pilgrims Saw: How Ecologists Reconstruct Past Vegetation.”

Lauren Howard, Ed Miller, and the chairperson contributed to the species list. Taxonomy follows Weakley, Ludwig, and Townsend. 2012. *Flora of Virginia*.

Attendance: 22. Report by chairperson: Emily Southgate.

10–11 May (Saturday–Sunday): Retracing the Bartrams’ Travels in the Catskill Forest Preserve, Greene County, NY. Joint Field Meeting of the Torrey Botanical Society, the Olive Natural Heritage Society, Catskill Native Plant Society, the Mountain Top Historical Society, and the Philadelphia Botanical Club.

The field trip to the Catskills was a two-day event commemorating the botanical collecting forays to the Catskill Mountains by William and John Bartram in the 1740s–50s. The Bartrams had come to the Catskills to find botanical curiosities to send to England, as American plants were all the rage of the English gentry. Specifically they had come for the “Balm of Gilead” (*Abies balsamea*), more commonly known as the balsam fir, which was especially coveted for manor houses and grand estate gardens.

Field Trip to Diamond Notch in Hunter-West Kill Wilderness Area.

Saturday’s hike was to Diamond Notch. Although the Bartrams never visited here, it was selected as a site because at the top of the notch is a nearly pristine example of primary growth forest, never logged for lumber, charcoal or tanning, the main early industries of the Catskill region. Participants hiked the approximately 4-mile round trip. Yellow birch, paper birch, and sugar maple interspersed with hemlock dominated through most of the hike. Unfortunately, because of the unusually cold, snowy winter and late spring, many of the ephemerals were just poking out their heads. Still, purple trillium, spring beauty, dogtooth violet, Canada mayflower, and bluebead were evident in abundance. Violets were everywhere and six different species were identified. Foamflower and miterwort dotted the slopes, while a few columbine and red baneberry were also found. Perhaps the best finds of the day were a rock face seep festooned with golden saxifrage and a rare white form of the purple trillium.

Reaching the top of the notch, a primary growth forest of red spruce and hemlock towered on the slopes above us. In a crevasse still filled with snow and ice we found what the Bartrams came to the Catskills for – the balsam fir (*Abies balsamea* (L.) Mill.). Unfortunately, we did not have time to explore the primary forest on the slopes above. We lunched by the beautiful West Kill Falls, worth the trip alone, before heading back down. On the way, a passing rainstorm dampened, but did not ruin the high spirits of the day’s hike.

In the evening Joel Fry, the Curator of Bartram’s Garden in Philadelphia, presented an informative lecture about the Bartrams’ importance to American botany and the details of their trips to the Catskills at the MTHS’s renovated Ulster and Delaware Train Station in Haines Falls.

Plant List for Diamond Notch (10 May).

Aceraceae: *Acer pensylvanicum* L. – moosewood, *Acer saccharum* Marsh. – sugar maple, *Acer spicatum* Lam. – mountain maple; **Adoxaceae:** *Sambucus canadensis* L. – American black elderberry, *Viburnum acerifolium* L. – mapleleaf viburnum, *Viburnum lantanoides* Michx. – hobblebush; **Amaryllidaceae:** *Allium tricoccum* Aiton – ramp; **Araceae:** *Arisaema*

triphyllum (L.) Schott – jack-in-the-pulpit; **Aristolochiaceae**: *Asarum canadense* L. – Canadian wild ginger; **Ruscaceae**: *Maianthemum racemosum* Link. – feathery false lily-of-the-valley, *Maianthemum canadense* Desf. – Canada mayflower; **Aspleniaceae**: *Asplenium trichomanes* L. – maidenhair spleenwort; **Asteraceae**: *Nabalus altissimus* (L.) Hook – tall rattlesnakeroot, *Taraxacum officinale* Weber ex Wiggers – dandelion, *Tussilago farfara* L. – colt's foot; **Balsaminaceae**: *Impatiens pallida* Nutt. – pale touch-me-not; **Berberidaceae**: *Caulophyllum giganteum* (Farw.) LeConte & Blackwell – early blue cohosh; **Betulaceae**: *Betula alleghaniensis* Britton – yellow birch, *Betula lenta* L. – cherry birch, *Betula papyrifera* Marsh. – paper birch, *Ostrya virginiana* (Mill.) K. Koch – hophornbeam; **Brassicaceae**: *Alliaria petiolata* (Bieb.) Cav. & Grande – garlic mustard, *Barbarea vulgaris* R. Br. ex Ait. – Garden yellowrocket, *Cardamine diphylla* (Michx.) Wood – toothwort; **Caprifoliaceae**: *Diervilla lonicera* Mill. – northern bush honeysuckle, *Lonicera canadensis* W. Bartram ex Marshall – American fly honeysuckle; **Colchicaceae**: *Uvularia sessilifolia* L. – sessileleaf bellwort; **Dryopteridaceae**: *Dryopteris carthusiana* (Vill.) Fuchs – spinulose woodfern, *Dryopteris intermedia* (Muhl. ex Willd.) A. Gray – intermediate woodfern, *Polystichum acrostichoides* (Michx.) Schott – Christmas fern; **Fagaceae**: *Fagus grandifolia* Ehrh. – American beech, *Quercus rubra* L. – red oak; **Geraniaceae**: *Geranium robertianum* L. – Robert geranium; **Grossulariaceae**: *Ribes cynosbati* L. – eastern prickly gooseberry, *Ribes glandulosum* Grauer – Skunk currant; **Hamamelidaceae**: *Hamamelis virginiana* L. – American witchhazel; **Huperziaceae**: *Huperzia lucidula* (Michx.) Trevis. – shining clubmoss; **Liliaceae**: *Clintonia borealis* (Ait.) Raf. – bluebead, *Erythronium americanum* Ker Gawl. – dogtooth violet, *Medeola virginiana* L. – cucumber root, *Streptopus lanceolatus* (Aiton) Reveal – twisted stalk; **Lycopodiaceae**: *Dendrolycopodium hickeyi* (W.H. Wagner, Beitel, & Moran) A. Haines – Hickey's tree-clubmoss, *Dendrolycopodium obscurum* (L.) A. Haines – flat-branched tree-clubmoss; **Melanthiaceae**: *Trillium erectum* L. – purple trillium, including the form *album*; *Veratrum viride* Aiton – false hellebore; **Montiaceae**: *Claytonia virginica* L. – Virginia spring beauty; **Oleaceae**: *Fraxinus americana* L. – white ash; **Orobanchaceae**: *Epifagus virginiana* (L.) W.P.C. Barton – beechdrops; **Oxalidaceae**: *Oxalis montana* Raf. – mountain woodsorrel; **Papaveraceae**: *Dicentra canadensis* (Goldie) Walp. – squirrel-corn, *Dicentra cucullaria* (L.) Bernh. – dutchman's breeches; **Pinaceae**: *Abies balsamea* (L.) Mill. – balsam fir, *Picea rubens* Sarg. – red spruce, *Tsuga canadensis* (L.) Carr. – eastern hemlock; **Polygonaceae**: *Rumex* L. sp. – a dock; **Polypodiaceae**: *Polypodium virginianum* L. – rock polypody; **Primulaceae**: *Lysimachia ciliata* L. – fringed loosestrife; **Ranunculaceae**: *Actaea rubra* (Aiton) Willd. – red baneberry, *Aquilegia canadensis* L. – Red columbine, *Ranunculus abortivus* L. – littleleaf buttercup, *Thalictrum pubescens* Pursh – meadow rue; **Rosaceae**: *Fragaria virginiana* Duchesne. – strawberry; **Rubiaceae**: *Mitchella repens* L. – partridgeberry; **Saxifragaceae**: *Chrysosplenium americanum* Schwein. ex Hook. – golden saxifrage, *Mitella diphylla* L. – twoleaf miterwort, *Micranthes virginiana* (Michx.) Small – early saxifrage, *Tiarella cordifolia* L. – heartleaf foamflower; **Taxaceae**: *Taxus canadensis* Marshall – Canada yew; **Urticaceae**: *Laportea canadensis* (L.) Wedd. – Canadian woodnettle; **Violaceae**: *Viola sororia* Willd. – common blue violet, *Viola canadensis* L. – Canada violet, *Viola macloskeyi* F. Lloyd var. *pallens* Banks ex A.P. de Candolle) C.L. Hitchcock – small white violet, *Viola pubescens* Ait. – downy yellow violet, *Viola rotundifolia* Michx. – round-leaved violet, and *Viola selkirkii* Pursh ex Goldie – Selkirk's violet.

Field Trip to North-South Lake Campgrounds.

John Bartram's field notes were not detailed enough to pinpoint exactly all of the Catskill localities he and his son visited. It is known from John Bartram's letters that they visited North-South Lake on their 1753 trip, and this was the site of Sunday's hike. Many plants were still asleep from the long cold winter and late spring, but it was still a fine day for botanizing. Twenty-one hikers participated in loosely retracing the Bartrams' footsteps. Along the way Robert Guildersleeve pointed out the important historical aspects of the site from the Bartrams' day to the present. He was able to pinpoint the rock underneath which the Bartrams camped. Maidenhair spleenwort was found growing on the wall under the rock. At the site of the Catskill Mountain House, a popular destination for nineteenth century New Yorkers to beat the summer heat, rusty woodsia was located clinging to the edge of the cliff.

The area of North-South Lake has suffered from human disturbance because of its use as a campground and recreation area through the years. Nonetheless, many of the trails along the escarpment retained much of their natural splendor and rewarded hikers with sweeping vistas to the east. Pitch pine, yellow birch, beech, red oak, white pine, red spruce, shagbark hickory, and sugar maple dominated the canopy. Mountain laurel, striped maple, and witch hazel were the main understory trees and shrubs. Pipsissewa was a nice rarity growing along the trailside, while a fair population of flowering trailing arbutus was located in the woods.

After the hike along the escarpment we continued along the lakeside where purple pitcherplant was spotted on an island in the lake and leatherleaf, along the shore. With the help of Michael Kudish we were able to locate a small stand of balsam fir, the only example we could confirm. Perhaps these trees were the progeny of the firs from which the Bartrams collected. The author was sure he had seen some other balsam fir growing along the trailside. Perhaps a future trip would be in order to document the extent of balsam fir at North-South Lake. From there we drove over to the top of Kaaterskill Falls for a breathtaking vista of Kaaterskill Clove and Hunter Mountain beyond. On a rock near the falls, a few specimens of Michaux's stitchwort were found, providing a good end to a great weekend.

Plant List for North-South Lake, Kaaterskill Falls (11 May).

Aceraceae: *Acer pensylvanicum* L. – moosewood, *Acer saccharum* Marsh. – sugar maple, *Acer spicatum* Lam. – mountain maple; **Adoxaceae:** *Viburnum lantanoides* Michx. – hobblebush; **Amaryllidaceae:** *Allium tricoccum* Aiton – ramp; **Anacardiaceae:** *Rhus glabra* L. – smooth sumac; **Araliaceae:** *Aralia nudicaulis* L. – wild sarsaparilla; **Aspleniaceae:** *Asplenium trichomanes* L. – maidenhair spleenwort; **Asteraceae:** *Antennaria neglecta* Greene – field pussytoes, *Arctium minus* (Hill) Bernh. – lesser burdock, *Taraxacum officinale* Weber ex Wiggers – dandelion; **Betulaceae:** *Betula alleghaniensis* Britton – yellow birch, *Betula papyrifera* Marsh. – paper birch; **Caprifoliaceae:** *Lonicera canadensis* W. Bartram ex Marshall – American fly honeysuckle; **Caryophyllaceae:** *Minuartia michauxii* (Fenzl) Farw. – Michaux's stitchwort; **Cladoniaceae:** *Cladonia* P. Browne sp. – a reindeer lichen; **Cyperaceae:** *Carex folliculata* L. – northern long sedge, *Scirpus* L. sp. – a bulrush; **Dryopteridaceae:** *Dryopteris carthusiana* (Vill.) Fuchs – spinulose woodfern, *Polystichum acrostichoides* (Michx.) Schott – Christmas fern; **Ericaceae:** *Chamaedaphne calyculata* (L.) Moench – leatherleaf, *Chimaphila umbellata* (L.) W.P.C. Barton – pipsissewa, *Epigaea repens* L. – trailing arbutus, *Gaultheria procumbens* L. – eastern teaberry, *Kalmia latifolia* L. – mountain laurel, *Monotropa uniflora* L. – Indianpipe, *Pyrola* L. sp. – a wintergreen,

Rhododendron periclymenoides (Michx.) Shinnars – pinkster flower, *Vaccinium angustifolium* Aiton – lowbush blueberry, *Vaccinium corymbosum* L. – highbush blueberry; **Euphorbiaceae**: *Euphorbia cyparissias* L. – cypress spurge; **Fagaceae**: *Castanea dentata* (Marshall) Borkh. – American chestnut, *Fagus grandifolia* Ehrh. – American beech, *Quercus rubra* L. – red oak; **Grossulariaceae**: *Ribes cynosbati* L. – eastern prickly gooseberry, *Ribes glandulosum* Grauer – skunk currant; **Hamamelidaceae**: *Hamamelis virginiana* L. – American witchhazel; **Iridaceae**: *Iris* L. sp. – an iris; **Juglandaceae**: *Carya ovata* (Mill.) K. Koch – shagbark hickory; **Lamiaceae**: *Salvia* L. sp. – a sage; **Liliaceae**: *Streptopus lanceolatus* (Aiton) Reveal – lance-leaved twistedstalk; **Lycopodiaceae**: *Dendrolycopodium hickeyi* (W.H. Wagner, Beitel & Moran) A. Haines – Hickey’s tree-clubmoss, *Dendrolycopodium obscurum* L. – flat-branched tree-clubmoss; **Onocleaceae**: *Onoclea sensibilis* L. – sensitive fern; **Pinaceae**: *Abies balsamea* (L.) Mill. – balsam fir, *Picea rubens* Sarg. – red spruce, *Pinus rigida* Mill. – pitch pine, *Pinus strobus* L. – white pine, *Tsuga canadensis* (L.) Carr. – eastern hemlock; **Plantaginaceae**: *Veronica officinalis* L. – common speedwell; **Poaceae**: *Danthonia spicata* (L.) P. Beauv. ex Roem. & Schult. – poverty oat-grass, *Festuca* L. sp. – fescue; **Polypodiaceae**: *Polypodium virginianum* L. – rock polypody; **Polytrichaceae**: *Polytrichum* Hedw. sp. – a haircap moss; **Primulaceae**: *Lysimachia borealis* (Raf.) U. Manns. & Anderb. – starflower; **Pteridaceae**: *Pteridium aquilinum* (L.) Kuhn – bracken fern; **Rosaceae**: *Crataegus* L. sp. – hawthorn, *Fragaria virginiana* Duchesne. – strawberry, *Geum canadense* Jacq. – white avens, *Prunus pensylvanica* L. f. – pin cherry, *Prunus serotina* Ehrh. – black cherry, *Rubus hispidus* L. – bristly dewberry, *Sibbaldiopsis tridentata* (Aiton) Rydb. – three-toothed cinquefoil – *Sorbus americana* Marshall – American mountain ash, *Spiraea tomentosa* L. – steeplebush; **Rubiaceae**: *Houstonia caerulea* L. – azure bluet; **Ruscaceae**: *Maianthemum canadense* Desf. – Canada mayflower, **Salicaceae**: *Populus* L. sp. – a cottonwood, *Salix* L. sp. – a willow; **Sarraceniaceae**: *Sarracenia purpurea* L. – purple pitcherplant; **Saxifragaceae**: *Micranthes virginensis* Michx. – early saxifrage; **Sphagnaceae**: *Sphagnum* L. sp. – a peat moss; **Violaceae**: *Viola macloskeyi* F. Lloyd var. *pallens* (Banks ex A.P. Candolle) C.L. Hitchcock – small white violet, *Viola sororia* Willd. – common violet; **Woodsiaceae**: *Woodsia ilvensis* (L.) R. Br. – rusty woodsia; **Xanthorrhoeaceae**: *Hemerocallis fulva* (L.) L. – orange day-lily.

Attendance: 19 on 10 May; 21 on 11 May.

Leaders: Paul Harwood and Uli Lorimer. Report by the former.

17 May (Saturday): Kelly’s Run and Tucquan Glen, Lancaster County, PA. Joint trip with the Delaware Valley Fern and Wildflower Society.

The trip began at the Holtwood Recreation Area parking lot. We followed a trail into a somewhat weedy, ecotonal woods crossed by two open powerline cuts. The woods gradually became richer, with blooming pawpaw (*Asimina triloba*), common in the area. As the trail approached the ravine of Kelly’s Run, the woods became drier and rockier, with outcrops of mica schist (Octoraro Formation). Mountain laurel (*Kalmia latifolia*), Chestnut oak (*Quercus montana*), American chestnut (*Castanea dentata*) root sprouts, and other dry woods species could be observed. After descending to the floor of the ravine, a short walk brought us to an immense ledge of schist, projecting from the south wall of the ravine. Mountain spleenwort (*Asplenium montanum*) was seen growing in crevices, and a careful examination of sheltered cracks disclosed the gametophytes of weft fern (*Crepidomanes intricatum*) and Appalachian shoestring fern (*Vittaria appalachiana*).

We returned to the parking lot and drove north on River Road to the crossing of Tucquan Creek at Erb's Mill. Lobed spleenwort (*Asplenium pinnatifidum*) was found in crevices of the schist cliff here. We followed the trail west, ascending to and following the north rim of Tucquan Glen. Despite the acid bedrock, the forest here is rich, yielding ginseng (*Panax quinquefolius*), northern maidenhair (*Adiantum pedatum*), Susquehanna trillium (*Trillium* aff. *flexipes*), and showy orchis (*Galearis spectabilis*), among others. Near the mouth of the ravine, several Bradley's spleenwort (*Asplenium bradleyi*) were found growing in the crevices of a boulder. After a short rest, we returned by our entrance route, observing a few species that we had missed on the way in, including blooming violet wood-sorrel (*Oxalis violacea*).

Species observed at Kelly's Run:

Acer negundo, *A. platanoides*, *A. rubrum*, *A. saccharinum*, *Alliaria petiolata*, *Allium vineale*, *Ambrosia artemisiifolia*, *Amelanchier* sp., *Anthoxanthum odoratum*, *Aralia nudicaulis*, *Arisaema triphyllum*, *Asimina triloba*, *Asplenium montanum*, *Athyrium filix-femina*, *Berberis thunbergii*, *Betula* cf. *lenta*, *Cardamine hirsuta*, *Carex* sp., *Carya* sp., *Castanea dentata*, *Caulophyllum thalictroides*, *Celastrus orbiculatus*, *Chelone glabra*, *Chimaphila maculata*, *Circaea canadensis*, *Clematis virginiana*, *Cornus alternifolia*, *C. florida*, *Crepidomanes intricatum*, *Cryptotaenia canadensis*, *Dactylis glomerata*, *Dendrolycopodium obscurum*, *Dennstaedtia punctilobula*, *Dichanthelium clandestinum*, *Dryopteris carthusiana*, *D. intermedia*, *D. marginalis*, *Erigeron* sp., *Euonymus alatus*, *Eurybia divaricata*, *Fagus grandifolia*, *Fraxinus* sp., *Galium* cf. *aparine*, *G. circaezans*, *Gaylussacia frondosa*, *Geranium maculatum*, *Geum* sp., *Goodyera pubescens*, *Hamamelis virginiana*, *Huperzia lucidula*, *Hydrangea arborescens*, *Ilex opaca*, *Juglans nigra*, *Kalmia latifolia*, *Lactuca* sp., *Lindera benzoin*, *Liriodendron tulipifera*, *Lonicera* sp., *L. japonica*, *Maianthemum canadense*, *M. racemosum* (= *Smilacina racemosa*), *Medeola virginiana*, *Mitchella repens*, *Nabalus* sp. (= *Prenanthes* sp.), *Nyssa sylvatica*, *Onoclea sensibilis*, *Osmorhiza claytonii*, *Parathelypteris noveboracensis* (= *Thelypteris noveboracensis*), *Parthenocissus quinquefolia*, *Persicaria* sp., *P. perfoliata* (= *Polygonum perfoliatum*), *Philadelphus* cf. *coronarius*, *Phytolacca americana*, *Picea* sp., *Pinus strobus*, *Plantago* sp., *Podophyllum peltatum*, *Polygonatum biflorum*, *Polypodium virginianum* complex, *Polystichum acrostichoides*, *Potentilla* sp. (*P. canadensis* or *P. simplex*), *P. indica*, *Prunus* sp., *Quercus alba*, *Q. montana*, *Q. rubra*, *Ranunculus abortivus*, *R. recurvatus*, *Rhododendron maximum*, *R. periclymenoides*, *Rosa multiflora*, *Rubus* sp., *Rumex acetosella*, *R. crispus*, *Sambucus canadensis*, *Sassafras albidum*, *Schizachyrium scoparium*, *Smilax rotundifolia*, *Solidago* sp., *Taraxacum officinale*, *Toxicodendron radicans*, *Trifolium pratense*, *Tsuga canadensis*, *Ulmus rubra*, *Vaccinium pallidum*, *Verbascum thapsus*, *Viburnum acerifolium*, *V. dentaria*, *Viola blanda*, *V. sororia*, *Vitis* sp., and *Vittaria appalachiana*.

Species observed at Tucquan Glen:

Acer negundo, *A. platanoides*, *A. rubrum*, *Actaea racemosa*, *Adiantum pedatum*, *Agrimonia parviflora*, *Alliaria petiolata*, *Amphicarpaea bracteata*, *Anthoxanthum odoratum*, *Arisaema triphyllum*, *Asarum canadense*, *Asimina triloba*, *Asplenium bradleyi*, *A. pinnatifidum*, *A. platyneuron*, *Athyrium filix-femina* f. *rubellum*, *Barbarea vulgaris*, *Berberis thunbergii*, *Betula* cf. *allegheniensis*, *Boechera laevigata* (= *Arabis laevigata*), *Botrychium virginianum* (= *Botrypus virginianus*), *Cardamine concatenata* (= *Dentaria laciniata*), *Carex* sp., *C. laxiflora*, *C. cf. pensylvanica*, *Castanea dentata*, *Caulophyllum thalictroides*, *Celastrus orbiculatus*, *C. cf. scandens*, *Celtis* sp., *Circaea canadensis*, *Claytonia*

virginica, *Collinsonia canadensis*, *Conopholis americana*, *Cornus alternifolia*, *Corydalis flava*, *Crataegus* sp., *Cryptotaenia canadensis*, *Cystopteris tenuis*, *Deparia acrostichoides*, *Desmodium* sp., *Dioscorea villosa*, *Dryopteris intermedia*, *Erythronium americanum*, *Eurybia divaricata*, *Eutrochium* sp., *Fagus grandifolia*, *Galearis spectabilis*, *Galium* sp., *G. aparine*, *G. circaezans*, *G. cf. lanceolatum*, *Geranium maculatum*, *Geum* sp., *G. aleppicum*, *Glechoma hederacea*, *Gleditsia triacanthos*, *Hamamelis virginiana*, *Hieracium venenosum*, *Huperzia lucidula*, *Impatiens* sp., *Kalmia latifolia*, *Lamium purpureum*, *Lindera benzoin*, *Liriodendron tulipifera*, *Lonicera* sp., *L. japonica*, *Maianthemum racemosum*, *Medeola virginiana*, *Mitchella repens*, *Myosotis* sp., *Nabalus* sp., *Onoclea sensibilis*, *Orobanche uniflora*, *Osmorhiza longistylis*, *Osmunda claytoniana*, *Osmundastrum cinnamomeum*, *Oxalis violacea*, *Packera aurea* (= *Senecio aureus*), *Panax trifolius*, *P. quinquefolius*, *Parthenocissus quinquefolius*, *Phegopteris hexagonoptera*, *Podophyllum peltatum*, *Polygonatum biflorum*, *Polypodium virginianum* complex, *Polystichum acrostichoides*, *Potentilla indica* (= *Duchesnia indica*), *Quercus montana*, *Q. rubra*, *Ranunculus abortivus*, *R. bulbosus*, *Rubus* sp., *R. phoenicolasius*, *Rumex crispus*, *Sambucus canadensis*, *Sanguinaria canadensis*, *Sanicula* sp., *Sassafras albidum*, *Smilax glauca*, *S. herbacea*, *Solidago flexicaulis*, *Symplocarpus foetidus*, *Taraxacum officinale*, *Thalictrum* cf. *dioicum*, *T. thalictroides* (= *Anemonella thalictroides*), *Toxicodendron radicans*, *Trillium* aff. *flexipes* (Susquehanna hybrid swarm), *Tsuga canadensis*, *Ulmus rubra*, *Uvularia perfoliata*, *Vaccinium angustifolium*, *Viburnum acerifolium*, *Viola* sp., and *V. striata*.

Attendance: 4. **Report by leader: Christopher Hoess.**

24 May (Saturday): Unionville Serpentine Barrens, Chester County, PA.

This visit to one of Pennsylvania's highest-quality serpentine barrens came near the 51-year anniversary of a field trip led on April 27, 1963 by Dr. Robert B. Gordon of West Chester University and Dr. Edgar T. Wherry, retired Penn professor and president of the PBC. It was also a follow-up to a PBC-Muhlenberg Botanical Society trip on 5 June 2010 led by Dr. Roger Latham (the present trip leader). Since the 2010 trip much progress had been made on serpentine grassland restoration, undertaken by the Natural Lands Trust under the trip leader's guidance. Two-thirds of the Unionville Barrens are protected as part of NLT's 1,100-acre ChesLen Preserve. The grasslands and post oak (*Quercus stellata*) – Bush oak (*Q. ×bushii*) – dwarf chinkapin oak (*Q. prinoides*) woodlands are remnants of a landscape managed for centuries by Native American using fire. With fire exclusion, the species-rich serpentine grasslands shrank from nearly 60 acres in 1937 to less than 9 acres in 2010, but have been more than doubled since then by cutting back 12½ acres of encroaching forest. The loss in area led to species extirpation: 21 state-listed species of concern occur there now but 9 more found there historically are gone. N.L.T. plans to restore and maintain at least 40 acres of serpentine grassland. The blueprint for that effort is the *Unionville Barrens Restoration and Management Plan*, posted at the trip leader's website (www.continentalconservation.us), which also describes the site's history, flora and ecology.

Participants took a 1¼-mile walk across rugged terrain to explore ancient serpentine grassland remnants, the newly cleared grassland restoration area, serpentine wetlands, serpentine oak woodland, dry oak forest, and nineteenth-century corundum, feldspar and serpentine building stone mining pits. Highlights included the globally rare serpentine aster (*Symphyotrichum depauperatum*), which was still in its overwintering rosette form and just beginning to send up flowering culms. Other state-listed species of concern

we saw were small-leaf white-snakeroot (*Ageratina aromatica*), Elliott's beardgrass (*Andropogon gyrans*), whorled milkweed (*Asclepias verticillata*), Bicknell's hoary rockrose (*Helianthemum bicknellii*) and, in flower, barrens chickweed (*Cerastium velutinum* var. *velutinum*), tufted hairgrass (*Deschampsia cespitosa*), rock sandwort (*Minuartia michauxii*) and Small's ragwort (*Packera anonyma* = *Senecio anonymus*). A tentative identification was made of one other state-listed species, also in flower, strict blue-eyed grass (*Sisyrinchium montanum* var. *crebrum*). Many other species unusual for the northern Piedmont were seen, for instance lyre-leaf rockcress (*Arabidopsis lyrata* = *Arabis lyrata*), Virginia snakeroot (*Aristolochia serpentaria*), low bindweed (*Calystegia spithamea*) and rose-pink (*Sabatia angularis*). Multicolored clumps of moss phlox (*Phlox subulata*) were in full bloom. Two hybrid oaks were tentatively identified: Bush's oak (*Quercus* × *bushii* = *Q. marilandica* × *velutina*) was abundant in savannas, edges and woodlands along with post oak (*Q. stellata*) and a mature probable Faxon oak (*Q.* × *faxonii* = *Q. alba* × *prinoides*) was seen along the trail. The water oak (*Q. nigra*) seen on the 2010 field trip and thought to be the only wild-occurring member of its species in Pennsylvania, had recently died and is not sending up root sprouts.

Field trip species list:

Red maple (*Acer rubrum*), common yarrow (*Achillea millefolium*), small-leaf white-snakeroot (*Ageratina aromatica*), tree-of-heaven (*Ailanthus altissima*), garlic mustard (*Alliaria petiolata*), common ragweed (*Ambrosia artemisiifolia*), shadbush (*Amelanchier* sp.), hog-peanut (*Amphicarpaea bracteata*), Elliott's beardgrass (*Andropogon gyrans*), plantain-leaf pussytoe (*Antennaria plantaginifolia*), sweet vernal grass (*Anthoxanthum odoratum*), lyre-leaf rockcress (*Arabidopsis lyrata* = *Arabis lyrata*), jack-in-the-pulpit (*Arisaema triphyllum*), Virginia snakeroot (*Endodeca serpentaria* = *Aristolochia serpentaria*), whorled milkweed (*Asclepias verticillata*), ebony spleenwort (*Asplenium platyneuron*), southern lady fern (*Athyrium filix-femina*), wild indigo (*Baptisia tinctoria*), Japanese barberry (*Berberis thunbergii*), rattlesnake fern (*Botrychium virginianum* = *Botrypus virginianus*), low bindweed (*Calystegia spithamea*), white-tinge sedge (*Carex albicans*), blue sedge (*C. glaucoidea*), eastern star sedge (*C. radiata*), awl-fruit sedge (*C. stipata*), parachute sedge (*C. tonsa* var. *rugosperma*), parasol sedge (*C. umbellata*), Oriental bittersweet (*Celastrus orbiculatus*), barrens chickweed (*Cerastium velutinum* var. *velutinum*), pipsissewa (*Chimaphila maculata*), enchanter's-nightshade (*Circaea canadensis*), flowering dogwood (*Cornus florida*), hay-scented fern (*Dennstaedtia punctilobula*), tufted hairgrass (*Deschampsia cespitosa*), poverty panic-grass (*Dichanthelium depauperatum*), panic-grass (*D. sphaerocarpon*), spinulose wood fern (*Dryopteris carthusiana*), evergreen wood-fern (*D. intermedia*), marginal wood fern (*D. marginalis*), autumn-olive (*Elaeagnus umbellata*), slender spike-rush (*Eleocharis tenuis*), daisy fleabane (*Erigeron philadelphicus*), boneset (*Eupatorium perfoliatum*), white wood aster (*Eurybia divaricata*), American beech (*Fagus grandifolia*), wild licorice (*Galium circaezans*), black huckleberry (*Gaylussacia baccata*), Bicknell's hoary rockrose (*Helianthemum bicknellii*), rattlesnake-weed (*Hieracium venosum*), bluets (*Houstonia caerulea*), common St. John's-wort (*Hypericum perforatum*), spotted St. John's-wort (*H. punctatum*), yellow star-grass (*Hypoxis hirsuta*), jewelweed (*Impatiens* sp.), greater whorled-pogonia (*Isotria verticillata*), soft rush (*Juncus effusus*), eastern red-cedar (*Juniperus virginiana*), slender bush-clover (*Lespedeza virginica*), border privet (*Ligustrum obtusifolium*), spicebush (*Lindera benzoin*), tuliptree (*Liriodendron tulipifera*), spiked lobelia (*Lobelia spicata*), Japanese honeysuckle (*Lonicera japonica*), honeysuckle (*Lonicera* sp.), field woodrush (*Luzula multiflora*), whorled loosestrife

(*Lysimachia quadrifolia*), early saxifrage (*Micranthes virginensis* = *Saxifraga virginensis*), Japanese stiltgrass (*Microstegium vimineum*), rock sandwort (*Minuartia michauxii*), Chinese silvergrass (*Miscanthus sinensis*), partridgeberry (*Mitchella repens*), rattlesnake-root (*Nabalus* sp. = *Prenanthes* sp.), blackgum (*Nyssa sylvatica*), sundrops (*Oenothera fruticosa*), sensitive fern (*Onoclea sensibilis*), interrupted fern (*Osmunda claytoniana*), southern yellow wood-sorrel (*Oxalis dillenii*), Small's ragwort (*Packera anonyma* = *Senecio anonymus*), New York fern (*Parathelypteris noveboracensis* = *Thelypteris noveboracensis*), Virginia-creeper (*Parthenocissus quinquefolia*), princess-tree (*Paulownia tomentosa*), moss phlox (*Phlox subulata*), pokeweed (*Phytolacca americana*), ragged fringed-orchid (*Platanthera lacera*), mayapple (*Podophyllum peltatum*), Solomon's-seal (*Polygonatum biflorum*), Christmas fern (*Polystichum acrostichoides*), bigtooth aspen (*Populus grandidentata*), dwarf cinquefoil (*Potentilla canadensis*), common cinquefoil (*P. simplex*), rattlesnake-root (*Prenanthes* sp.), heal-all (*Prunella vulgaris*), sweet cherry (*Prunus avium*), wild black cherry (*P. serotina*), Bush's oak (tentative identification — *Quercus* × *bushii* = *Q. marilandica* × *velutina*), Faxon oak (tentative identification — *Quercus* × *faxonii* = *Q. alba* × *prinoides*), northern red oak (*Q. rubra*), post oak (*Q. stellata*), black oak (*Q. velutina*), pinxter-flower (*Rhododendron periclymenoides*), black locust (*Robinia pseudoacacia*), pasture rose (*Rosa carolina*), multiflora rose (*R. multiflora*), wineberry (*Rubus phoenicolasius*), a blackberry (*Rubus* sp.), rose-pink (*Sabatia angularis*), Canadian sanicle (*Sanicula canadensis*), sassafras (*Sassafras albidum*), early saxifrage (*Saxifraga virginensis*), little bluestem (*Schizachyrium scoparium*), hyssop skullcup (*Scutellaria integrifolia*), white-topped aster (*Sericocarpus asteroides*), strict blue-eyed grass (tentative identification - *Sisyrinchium montanum*), needletip blue-eyed grass (*S. mucronatum*), cat greenbrier (*Smilax glauca*), roundleaf greenbrier (*S. rotundifolia*), bluestem goldenrod (*Solidago caesia*), common chickweed (*Stellaria media*), serpentine aster (*Symphotrichum depauperatum*), skunk-cabbage (*Symplocarpus foetidus*), common dandelion (*Taraxacum officinale*), poison-ivy (*Toxicodendron radicans*), white clover (*Trifolium repens*), cat-tail (*Typha* sp.), lowbush blueberry (*Vaccinium pallidum*), mullein (*Verbascum* sp.), common speedwell (*Veronica officinalis*), maple-leaf viburnum (*Viburnum acerifolium*), black-haw (*V. prunifolium*), arrow-leaf violet (*Viola sagittata*), common blue violet (*V. sororia*), grape (*Vitis* sp.).

The species list was compiled by Janet Novak.

Attendance: ca. 20. Report by leader: Roger Latham.

25 May (Sunday): Blackbird State Forest, Delaware.

Leader: Chris Hoess. Trip cancelled.

08 June (Sunday): Edison Bog, Sparta Mountain Preserve, Sussex County, NJ.

Edison Bog was chosen as a field trip destination because it is perhaps as close to unique in northern New Jersey as a single site can be. It is a moderately minerotrophic bog, placing it on the spectrum between northern New Jersey's well-known calcareous fens and nutrient poor acid bogs. The preserve is surrounded and protected by large tracts of upland forest. And unlike many other protected areas in the metropolitan area, the deer population is kept in check by local hunters. This fortunate crossroad of geology and hunting produces an impressive list of species for one preserve. The total number observed on various field trips approaches 440.

We traversed a variety of habitats including fields, upland woods, and various mesic and wet sites in addition to the bog itself. We worked our way around about one 1/3 of the bog, recording 270 species. (A followup trip to complete the loop of the bog is recommended.) The surrounding forest was in remarkably good condition, including *Acer pensylvanicum*, *A. saccharum*, *Betula alleghaniensis*, *Castanea dentata*, *Juglans nigra*, *Populus grandidentata*, and *Cornus alternifolia*. The shrub layer was fairly typical but produced a few notable species: *Vaccinium stamineum*, *Viburnum nudum* var. *cassinoides*, *Sambucus nigra*, *Salix eriocephala*, and *Kalmia latifolia*.

Among a rich herb layer were the following species: *Actaea pachypoda*, *Alisma subcordatum*, *Anemone virginiana*, *Antennaria plantaginifolia*, *Apocynum androsaemifolium*, *Aquilegia canadensis*, *Arabis glabra*, *Aralia nudicaulis*, *Arisaema triphyllum* subsp. *triphyllum*, *Asclepias exaltata*, *A. quadrifolia*, *A. syriaca*, *Brasenia schreberi*, *Calla palustris*, *Chelone glabra*, *Chimaphila maculata*, *C. umbellata*, *Cicuta bulbifera*, *C. maculata*, *Circaea canadensis* subsp. *canadensis*, *Collinsonia canadensis*, *Cryptotaenia canadensis*, *Cypripedium acaule*, *Desmodium glutinosus*, *Epipactis helleborine*, *Eurybia macrophylla*, *Euthamia graminifolia*, *Fragaria virginiana*, *Galium lanceolatum*, *G. tinctorium*, *G. triflorum*, *Geum canadense*, *Goodyera pubescens*, *Helianthus divaricatus*, *Hieracium piloselloides*, *Hypericum punctatum*, *Hypoxis hirsuta*, *Iris versicolor*, *Krigia biflora*, *Lobelia inflata*, *Lysimachia borealis* (= *Trientalis borealis*), *L. quadrifolia*, *L. thyrsiflora*, *Medeola virginiana*, *Monarda fistulosa*, *Monotropa uniflora*, *Myosotis laxa*, *Nymphaea odorata*, *Oclemena acuminata*, *Osmorhiza claytonii*, *Packera aurea* (= *Senecio aureus*), *Penstemon digitalis*, *Persicaria amphibia* (= *Polygonum amphibium*), *Potentilla canadensis*, *Pyrola elliptica*, *Rudbeckia triloba*, *Sanicula marilandica*, *Scutellaria lateriflora*, *Sisyrinchium angustifolium*, *Solidago arguta*, *S. caesia*, *S. flexicaulis*, *Sparganium americanum*, *Thalictrum thalictroides* (= *Anemonella thalictroides*), *Trillium cernuum*, *Utricularia intermedia*, *Uvularia perfoliata*, *U. sessilifolia*, *Veratrum viride*, *Veronica officinalis*, *Viola cucullata*, *V. labradorica*, *V. pubescens*, *V. sagittata*, *V. sororia*, *V. palmata*, and *Zizia aurea*. (Many of the more common species were not recorded.)

Although we missed several of the early-flowering woodland species of sedges, we recorded the following: *Carex appalachica*, *C. blanda*, *C. gracillima*, *C. pensylvanica*, *C. rosea*, *Carex* sp. (sect. *Laxiflorae*), *Carex* sp. (sect. *Ovales*), *C. stipata*, *C. stricta*, and *C. virescens*.

The grasses encountered were fairly typical and not too numerous to mention them all: *Anthoxanthum odoratum*, *Arrhenatherum elatius*, *Dactylis glomerata*, *Dichanthelium clandestinum*, *Festuca subverticillata*, *Leersia virginica*, *Microstegium vimineum*, *Poa alsodes*, *P. annua*, *P. compressa*, *P. pratensis*, and *Schedonorus arundinaceus* (= *Festuca arundinacea*).

As one would expect we had a good list of ferns and fern allies: *Equisetum arvense*, *Huperzia lucidula*, *Diphasiastrum digitatum*, *Dendrolycopodium obscurum*, *Adiantum pedatum*, *Asplenium platyneuron*, *Athyrium filix-femina*, *Botrychium virginianum* (= *Botrypus virginianus*), *Cystopteris tenuis*, *Dennstaedtia punctilobula*, *Dryopteris carthusiana*, *D. intermedia*, *D. marginalis*, *Onoclea sensibilis*, *O. claytoniana*, *O. regalis* var. *spectabilis*, *Osmundastrum cinnamomeum* (= *Osmunda cinnamomea*), *Parathelypteris noveboracensis* (= *Thelypteris noveboracensis*), *Polypodium virginianum*, *Pteridium aquilinum*, and *Thelypteris palustris* var. *pubescens*.

Attendance: 9. Report by leader: David Austin.

14 June (Saturday): Fulshaw Craeg Preserve and Vicinity, Salford Township, Montgomery County, PA

Our walk started from the parking lot of Camp Green Lane about $\frac{3}{4}$ mile southwest of the main entrance of the Natural Lands Trust's Fulshaw Craeg Preserve on King Road. We were granted permission to park at the camp and explore the adjacent woods. Proceeding east on Camp Green Lane Road for about 1,000 feet, we came to the edge of a field where it meets a border of trees. We followed this border to a ballfield and from there turned right diagonally across a field and then through a wooded area to a bridge that crossed Ridge Valley Creek on Hausman Road. In this stretch, we saw *Ampelopsis brevipedunculata*, *Erigeron philadelphicus*, *E. pulchellus*, *E. annuus*, *Hieracium caespitosum*, *Houstonia caerulea*, *Krigia biflora*, *Lysimachia nummularia*, *Nuphar advena*, *Myosotis laxa*, *Populus grandidentata*, *Caulophyllum thalictroides*, *Actaea pachypoda*, *A. racemosa*, *Aureolaria virginica*, *Boechera laevigata* (= *Arabis laevigata*), *Cicuta maculata*, *Cryptotaenia canadensis*, *Cypripedium acaule*, *Mitella diphylla*, *Tradescantia virginiana*, and *Triodanis perfoliata*. After crossing the bridge, we followed (to the right) a trail along the creek heading upstream toward the Fulshaw Craeg Preserve, seeing along the way many of the species already observed. The preserve seems to have a 50 foot right-of-way on both sides of the creek and is associated with a powerline cut and a nice wooded area. On entering a large meadow (#4) on the preserve, we saw *Lobelia spicata* along with many of the species mentioned below. The next meadow (#3) yielded *Clematis virginiana*, *Collinsonia canadensis*, *Iris versicolor*, *Lysimachia ciliata*, *Oenothera fruticosa*, *Sanquisorba canadensis*, *Stachys palustris*, and *Veranocastrum virginicum*. Continuing our upstream walk, we came to a meadow (#2) which gave us *Hypoxis hirsuta* and *Phlox maculata*. Crossing the creek, we followed the trail to meadow #1 that borders King Road. Along the trail we saw *Waldsteinia fragarioides*. In and around the last meadow (#1), we came across *Chamaelirium luteum*, *Corydalis sempervirens*, *Cynoglossum virginianum*, *Eurybia macrophylla*, *Heuchera americana*, *Maianthemum canadense*, *Pedicularis canadensis*, *Pycnanthemum tenuifolium*, and *Salvia lyrata*.

Additional plants that were encountered throughout the day's exploration included *Achillea millefolium*, *Acer rubrum*, *A. saccharum*, *Adiantum platyneuron*, *Ageratina altissima*, *Agrimonia gryposepala*, *Alliaria petiolata*, *Allium canadense*, *A. vineale*, *Ambrosia artemisiifolia*, *A. trifida*, *Amelanchier arborea*, *Amphicarpaea bracteata*, *Anemone americana* (= *Hepatica nobilis* var. *obtusata*), *Apocynum cannabinum*, *Aquilegia canadensis*, *Arctium lappa*, *Arisaema triphyllum*, *Artemisia vulgaris*, *Asarum canadense*, *Asclepias syriaca*, *Boehmeria cylindrica*, *Botrychium virginianum*, *Calystegia sepium*, *Cardamine impatiens*, *Carex intumescens*, *C. lurida*, *Carpinus caroliniana*, *Carya cordiformis*, *C. ovata*, *Celastrus orbiculatus*, *Cercis canadensis*, *Circaea canadensis*, *Clematis virginiana*, *Cornus amomum*, *C. florida*, *Coronilla varia*, *Cryptotaenia canadensis*, *Desmodium paniculatum*, *Dichanthelium clandestinum*, *Dioscorea villosa*, *Dirca palustris*, *Dryopteris marginalis*, *Duchesnea indica*, *Erechites hieraciifolia*, *Euonymus alatus*, *Eutrochium fistulosum*, *Fagus grandifolia*, *Fallopia japonica*, *Fragaria virginiana*, *Fraxinus pennsylvanica*, *Galium aparine*, *G. circaezans*, *G. lanceolatum*, *G. mollugo*, *Geranium maculatum*, *G. robertianum*, *Glechoma hederacea*, *Hamamelis virginiana*, *Hylotelephium telephiodes* (= *Sedum telephiodes*), *Juglans nigra*, *Juncus effusus*, *Juniperus virginiana*, *Laportea canadensis*, *Leucanthemum vulgare*, *Ligustrum vulgare*, *Lindera benzoin*, *Liriodendron tulipifera*, *Lonicera japonica*, *Ludwigia palustris*, *Lysimachia nummularia*, *Maianthemum racemosum* (= *Smilacina racemosa*), *Microstegium vimineum*, *Onoclea sensibilis*, *Osmorhiza claytonii*, *Ostrya virginiana*, *Oxalis stricta*, *Parathelypteris noveboracensis*

(= *Thelypteris novaboracensis*), *Parthenocissus quinquefolia*, *Penstemon digitalis*, *Persicaria arifolia* (= *Polygonum arifolium*), *P. maculosa* (= *Polygonum persicaria*), *P. sagittata* (= *Polygonum sagittatum*), *P. virginiana* (= *Polygonum virginianum*), *Physocarpus opulifolius*, *Phytolacca americana*, *Plantago lanceolata*, *P. major*, *Podophyllum peltatum*, *Polygonatum biflorum*, *Polypodium virginianum*, *Polysticum acrostichoides*, *Potentilla canadensis*, *P. indica* (= *Duchesnea indica*), *Prunus avium*, *P. serotina*, *Quercus alba*, *Q. palustris*, *Q. rubra*, *Ranunculus abortivus*, *R. bulbosus*, *R. recurvatus*, *Rosa multiflora*, *R. palustris*, *R. virginiana*, *Rubus occidentalis*, *R. phoenicolasius*, *Rumex crispus*, *R. obtusifolius*, *Sambucus canadensis*, *Sanguinaria canadensis*, *Sassafras albidum*, *Securigera varia* (= *Coronilla varia*), *Sisyrinchium* sp., *Smilax glauca*, *S. rotundifolia*, *Solanum carolinense*, *Staphylea trifolia*, *Stellaria media*, *Symplocarpus foetidus*, *Taraxicum officinale*, *Stachys palustris*, *Thalictrum pubescens*, *T. thalictroides*, *Tilia americana*, *Toxicodendron radicans*, *Trifolium aureum*, *T. dubium*, *T. pratense*, *Tsuga canadensis*, *Ulmus rubra*, *Uvularia perfoliata*, *Vaccinium pallidum*, *V. stamineum*, *Verbascum thapsus*, *Verbena urticifolia*, *Vernonia noveboracensis*, *Veronica officinalis*, *V. persica*, *Viburnum acerifolia*, *V. prunifolium*, *Vicia tetrasperma*, *Viola labradorica*, *Zizia aurea*.

Thanks are extended to Dan Efroymson, Martin Page, and David Lauer for their contributions to the general list of plants observed.

Attendance: 4. Report by leader: Link Davis.

28 June (Saturday): "Britton's Savannah," Middle Branch of the Forked River and other nearby Bog Asphodel Sites, Ocean County, NJ.

Our group consolidated into four-wheel-drive vehicles at Wells Mills County Park along Route 532 about 4 miles west of Route 9 in Waretown. From here we headed northeast on Switch Road (a sand trail) to "Britton's Savannah," a New Jersey Conservation Foundation-owned property, situated between the Old Tuckerton Railroad right-of-way and the Garden State Parkway (GSP). This segment of a mineral-poor fen harbored a stunning *Narthecium americanum* (bog asphodel) population straddling more than a ½ mile span of the southern stem of the Middle Branch of the Forked River. Currently restricted to the Pine Barrens of New Jersey, this globally imperiled (G2, S2, E), rhizomatous, perennial herb of the *Nartheciaceae* occurred at this site on hummocks of sandy, peaty substrate often thickly carpeted by sphagnum mosses associated with groundwater seepage flow. While a few thousand culms of Bog Asphodel held aloft their dense, golden racemes, an equal number of sterile plants, likely threatened by shading, prevailed as well.

Shading brought on by canopy closure of *Chamaecyparis thyoides* (Atlantic white cedar) saplings and the encroachment of shrub thickets on vegetative shoots of this rare lily was addressed when the trip leader was engaged in 2011 by the NJCF and the Forked River Mountain Coalition to conduct vegetation management experiments on Bog Asphodel plots. Funded by the US Fish and Wildlife Service, these experiments involved cutting (and debris removal) of such shrubs as *Chamaedaphne calyculata* (leatherleaf), *Clethra alnifolia* (sweet pepperbush), *Eubotrys racemosa* (fetterbush), *Gaylussacia dumosa* (dwarf huckleberry), *Ilex glabra* (inkberry), *Kalmia angustifolia* (sheep laurel), *Morella caroliniensis* (evergreen bayberry), *Vaccinium corymbosum* (highbush blueberry), and saplings of both *Acer rubrum* (red maple) and especially *Chamaecyparis thyoides*. It was anticipated that canopy reduction (i.e., shade reduction) would encourage an increase in flowering of Bog Asphodel. However, four years of monitoring revealed that flowering increased only once, in 2011. During the remaining seasons, the mean monthly precipitation data provided by the Office

of the New Jersey Climatologist (Rutgers University), especially for the flowering period of June and July, revealed either wetter or drier than usual conditions. Ostensibly, these dramatic departures from a stable hydrological regime had a negative impact on flowering similar to that caused by shading.

The following were among the species growing in close proximity to the Bog Asphodel: *Amphicarpum amphicarpon* (Pine-barrens peanut grass), *Andropogon glomeratus* var. *glomeratus* (bushy beardgrass), *A. virginicus* var. *virginicus* (Virginia beardgrass), *Calamovilfa brevipilis* (Pine Barren reedgrass; LP), *Calopogon tuberosus* (grass-pink), *Carex atlantica* subsp. *atlantica* (Atlantic sedge), *C. collinsii* (Collin's sedge), *C. exilis* (coast sedge), *C. livida* (livid sedge), *C. bullata* (button sedge), *C. striata* (Walter's sedge), *Cladium mariscoides* (twig-rush), *Danthonia epilis* (bog oat-grass), *Dichanthelium ensifolium* (Britton's or small-leaved panic grass), *D. mattamuskeetense* (Mattamuskeet panic grass), *Drosera filiformis* (threadleaf sundew), *D. intermedia* (spoonleaf sundew), *D. rotundifolia* (roundleaf sundew), *Eleocharis robbinsii* (Robbins' spikerush), *E. tuberculosa* (large-tubercled spikerush), *Eriocaulon compressum* (flattened or early pipewort), *Eupatorium perfoliatum* (common boneset), *E. pilosum* (rough boneset), *Euthamia caroliniana* (slender flat-top goldenrod), *Gaylussacia frondosa* (dangleberry), *Hypericum canadense* (Canada St. John's-wort), *Juncus caesariensis* (New Jersey rush; G2G3, S2, E, LP), *Lobelia nuttallii* (Nuttall's lobelia), *Lophiola aurea* (golden crest), *Lyonia ligustrina* (maleberry), *L. mariana* (staggerbush), *Magnolia virginiana* (swamp magnolia), *Nymphaea odorata* subsp. *odorata* (white water-lily), *Oclemena nemoralis* (bog aster), *Orontium aquaticum* (golden club), *Panicum virgatum* (switchgrass), *Pseudolycopodiella caroliniana* (Carolina bog clubmoss; S3), *Pogonia ophioglossoides* (rose pogonia), *Rhynchospora fusca* (brown beaksedge), *Sarracenea purpurea* (purple pitcher plant), *Schizaea pusilla* (curly grass fern; G3G4, S3, LP), *Sphagnum flavicomans*, *S. magellanicum*, *S. portoricense* (S2), *S. pulchrum*, *S. tenerum*, *Symphyotrichum novi-belgii* (New York aster), *Utricularia cornuta* (horned bladderwort), *U. striata* (fibrous bladderwort), and *U. subulata* (zigzag bladderwort). For additional species and site information recorded from "Britton's Savannah" see Gordon's trip report for 28 June 2009 (*Bartonia* 66: 85–87. 2013).

After lunch at Wells Mills County Park, we stopped along Route 532 at Daniel's Bridge over the Oyster Creek in anticipation of seeing an occurrence of Bog Asphodel in a quaking bog bordering the stream on the south side of the road. Because of severe inundation of this site, we saw no sign of the rare lily. It is quite possible that this small station may have been extirpated by frequent prolonged flooding during the recent past.

About ¾ mile to the east on the north side of Route 532 just west of the southbound lane of the GSP, we visited a borrow pit that once provided sand and gravel used for the construction of the parkway. This excavation evolved into a unique sphagnum-carpeted bog that harbored a pocket of Atlantic white cedar, several hundred flowering culms of bog asphodel, a fine stand of New Jersey rush, two tiny patches of curly grass fern, and several blooming specimens of the orchids rose pogonia and grass-pink. Portions of the site have become invaded by *Phragmites australis* subsp. *australis* (common reed).

We next explored Van Pelt's 1906 bog asphodel collection site known as "Ostrom," named after a long-gone train stop west of Route 9 adjacent to the Middle Branch of the Forked River. What once comprised a substantial bog asphodel population in a diverse quaking bog community frequently visited by members of the Torrey and Philadelphia Botanical Clubs (fide the late Louis Hand, 1972) became decimated during the 1960s and

thereafter by dumping fill into the wetlands that straddled the railroad bed west of Route 9. Dredging a quarter mile segment of the river above the railroad trestle to create a pond and filling acres of cedar bog along its northern shore further expunged suitable habitat and severely altered the hydrology of the remaining swamp.

During a survey of the Ostrom site in October 1985, Jim Stasz and the leader observed an estimated 750 fruiting culms of bog asphodel totally confined to a peaty shoreline on the south bank of a cove leading north into adjacent dredged out Middle Branch. The site can be reached by crossing a rivulet adjacent to an abandoned railroad embankment located about 230 yards west of the Route 9 bridge over the river.

On a July 22, 1995 site revisit by the leader, suitable habitat had dwindled to a 17 yard \times 2 yard band of rich, sandy peat that sustained 24 flowering culms of bog asphodel. These plants were severely stressed by numerous competing herbs and shrubs as well as by canopy closure of cedar saplings. Remarkably, during the current site visit 19 years later, we counted a mere 9 culms in anthesis occupying the same narrow band of peat amid deep shade and totally surrounded by a deep pool of water.

Our final stop was at a site called "Above the Falls," about 0.3 mi. upstream of Ostrom. Here on September 1, 1996 the leader discovered a de novo occurrence of more than 2500 fruiting culms of *Narthecium americanum*. The site was likely harvested for pole cedar in the 1980s and contained areas of dense regeneration by deer-browsed cedar saplings. Alfred E. Schuyler and the leader returned in 1998 and, by extending the initial search area 1000 feet upstream, added another 8000 culms to the original count. However, an additional segment of about 800 feet extending to the GSP remained unsearched. During the present short visit to the eastern terminus of the site, we saw a few dozen scattered culms of the lily associated with New Jersey rush and curly grass fern in sphagnum-carpeted, savannah-like openings of the cedar bog. It quickly became clear to all that further exploration of this expansive, treacherous landscape required overcoming several formidable challenges: seepage flow, quagmire substrate, helter-skelter "windthrow," jagged snags, and rotting root systems.

Thanks go to Donna McBride and Terry Schmidt for their input to the species list.
Attendance: 22. Report by leader: Ted Gordon.

30 June (Monday): Houston Meadows, Fairmount Park, Philadelphia, PA. Joint trip with the Delaware Valley Fern and Wildflower Society.

Houston Meadows consists of two areas of dry grassland that remained open through a combination of sandy, acidic soil, fire, and grazing. After the meadows were incorporated into Fairmount Park in 1938, trees began to move in and the open areas shrank from around 80 acres to approximately 15 acres. Starting in 2009, the park undertook restoration by removing trees and planting seed, and now 30 acres are open. Tom Witmer, Director of Natural Resources in Fairmount Park, gave us a quick summary of the restoration effort. In the restored areas, common plants include various grasses (native and non-native), *Eupatorium serotinum*, *Triodanis perfoliata*, *Nuttallanthus canadensis* (= *Linaria canadensis*), *Brassica nigra*, and *Conyza canadensis* (= *Erigeron canadensis*). The areas that have been open continuously are more diverse. Notable plants include abundant *Eupatorium rotundifolium* (S3, vulnerable in PA) and *Asclepias viridiflora*, which we saw in tight bud.

Three species were new to most of us: *Paronychia canadensis*, a wispy native plant in the *Caryophyllaceae*; *Rosa setigera*, a rather floriferous prairie species that is adventive in eastern

Pennsylvania; and *Verbascum lychnitis*, a Eurasian species with branched inflorescences, quite distinct from the unbranched *Verbascum thapsus*. We saw *Erigeron annuus* and *E. strigosus* growing side by side, which was very helpful for learning to distinguish them.

We also botanized an open oak woodland adjacent to the south meadow. Notable species here were *Cunila origanoides*, *Paronychia canadensis*, *Danthonia compressa*, *D. spicata*, and *Vaccinium stamineum*.

In total, we recorded 130 species:

Acer rubrum, *Achillea millefolium*, *Ageratina altissima*, *Ailanthus altissima*, *Allium vineale*, *Ambrosia artemisiifolia*, *Antennaria* sp., *Anthoxanthum odoratum*, *Apocynum cannabinum*, *Aralia elata*, *Aralia nudicaulis*, *Arisaema triphyllum*, *Artemisia annua*, *Artemisia vulgaris*, *Asclepias syriaca*, *Asclepias tuberosa*, *Asclepias viridiflora*, *Baptisia tinctoria*, *Betula lenta*, *Betula populifolia*, *Bidens* sp. (perhaps *frondosa*), *Brassica rapa*, *Cardamine impatiens*, *Carex pensylvanica* or similar *Carex* sp., *Celastrus orbiculatus*, *Chamaecrista fasciculata*, *Chimaphila maculata*, *Cirsium arvense*, *Commelina* sp., *Conyza canadensis*, *Crataegus* sp., *Cunila origanoides*, *Danthonia compressa*, *Danthonia spicata*, *Dennstaedtia punctilobula*, *Desmodium canadense*, *Dichanthelium* sp., *Dryopteris* sp., *Epifagus virginiana*, *Erechtites hieraciifolia*, *Erigeron annuus*, *E. strigosus*, *Eupatorium album*, *E. hyssopifolium*, *E. rotundifolium* var. *ovatum*, *E. serotinum*, *Eurybia divaricata*, *Euthamia graminifolia*, *Fagus grandifolia*, *Fallopia scandens* (= *Polygonum scandens*), *Fraxinus* sp., *Gaylussacia baccata*, *Hypericum perforatum*, *H. punctatum*, *Ilex opaca*, *Juniperus virginiana*, *Lactuca* sp., *Lechea* sp., *Lespedeza capitata*, *Linaria vulgaris*, *Lindera benzoin*, *Liriodendron tulipifera*, *Lobelia inflata*, *Lonicera japonica*, *Lonicera* sp. (perhaps *L. morrowii*), *Lysimachia quadrifolia*, *Maianthemum racemosum* (= *Smilacina racemosa*), *Malus* sp. or cv., *Microstegium vimineum*, *Miscanthus sinensis*, *Monarda punctata*, *Monotropa uniflora*, *Morella pensylvanica* (= *Myrica pensylvanica*), *Nuttallanthus canadensis*, *Nyssa sylvatica*, *Onoclea sensibilis*, *Oxalis* sp., *Parathelypteris noveboracensis* (= *Thelypteris noveboracensis*), *Paronychia canadensis*, *Parthenocissus quinquefolia*, *Paulownia tomentosa*, *Penstemon digitalis*, *P. hirsutus*, *Photinia villosa*, *Phytolacca americana*, *Pinus strobus*, *Plantago aristata*, *P. major*, *Podophyllum peltatum*, *Polygonatum pubescens*, *Persicaria virginiana* (= *Polygonatum virginianum*), *Populus grandidentata*, *Potentilla simplex*, *Prunus serotina*, *Pteridium aquilinum*, *Pycnanthemum* sp. (perhaps *P. virginianum*), *Quercus alba*, *Q. imbricaria*, *Q. palustris*, *Q. velutina*, *Rhus copallina*, *R. glabra*, *R. typhina*, *Rosa multiflora*, *R. setigera*, *Rubus phoenicolasius*, *Rubus* sp., *Rudbeckia hirta*, *Rumex acetosella*, *R. obtusifolius*, *Sambucus canadensis*, *Sanicula* sp., *Sassafras albidum*, *Senecio vulgaris*, *Smilax rotundifolia*, *Solanum carolinianum*, *Solidago rugosa*, *Taraxacum* sp., *Toxicodendron radicans*, *Trifolium repens*, *Triodanis perfoliata*, *Vaccinium pallidum*, *V. stamineum*, *Verbascum lychnitis*, *V. thapsus*, *Verbena urticifolia*, *Viburnum acerifolium*, *V. prunifolium*, *V. sp* (perhaps *V. dilitatum*), and *Viola sagittata*.

Attendance: 18. Report by leader: Janet Novak.

07 July (Monday): Fairmount Island, Center City, Philadelphia, PA.

We paddled canoes to Fairmount Island, located in the Schuylkill River at the beginning of Boat House Row, behind the Philadelphia Museum of Art and immediately above Fairmount Dam. Our objective was to perform a botanical survey of the island for Philadelphia Parks and Recreation, which plans to develop the island as a park linked to the mainland. This island is a product of siltation produced by Fairmount Dam. During the twentieth century accumulation of sediment resurrected the island each time the City eliminated it by dredging. Its flora represents primary succession—that is, colonization

of a botanically barren substrate (in this case, mud flats) never before vegetated. It is a floodplain covered mostly by forbs and forest dominated by *Acer saccharinum* and *Salix* sp. The forest lacks topsoil and duff, which flooding washes away; here understory plants, both woody and herbaceous, are sparse or absent. (Deer do not inhabit this island.) Absent throughout the island are graminoids (including rushes and sedges), ferns and woody vines (*Toxicodendron radicans* occurs as a small shrub but not as a vine). In the vicinity of downtown Philadelphia, the plants of Fairmount Island constitute the only “wild” botanical community with natural edges, unmanaged succession, and a forest canopy.

The species we identified are: *Acer negundo* (in fruit), *A. rubrum* (many seedlings), *A. saccharinum*, *Ageratina altissima*, *Ailanthus altissima* (seedling), *Alnus glutinosa*, *Amaranthus spinosus*, *Amorpha fruticosa*, *Arctium minus* (flower bud), *Artemisia annua*, *A. vulgaris*, *Bidens* sp., *Catalpa* sp. (in fruit), *Calystegia sepium* (flowering, abundant), *Celtis occidentalis* (sapling), *Cuscuta* sp., *Cryptotaenia canadensis* (in fruit), *Erechtites hieraciifolia*, *Eupatorium serotinum*, *Fraxinus pennsylvanica*, *Gleditsia triacanthos*, *Gymnocladus dioica*, *Hibiscus moscheutos* (flower bud), *Humulus japonicus*, *Impatiens capensis* (flowering), *Iris pseudacorus* (in fruit), *Justicia americana* (flowering; only one plant, near northwest top of island), *Laportea canadensis*, *Lindernia dubia* (flowering), *Ludwigia palustris* (?), *L. peploides*, *Lycopus europaeus* (?), *Lysimachia nummularia*, *Lythrum salicaria* (flowering), *Mimulus alatus* (flower bud), *Mollugo verticillata* (flowering), *Morus alba*, *Peltandra virginica* (flowering and in fruit), *Persicaria lapathifolium*, *Phytolacca americana*, *Pilea pumila*, *Populus deltoides*, *Portulaca oleracea*, *Reynoutria japonica* (= *Polygonum cuspidatum*), *Rudbeckia laciniata*, *Rumex altissimus* (flowering and in fruit; abundant), *Salix* sp., *Scrophularia marilandica* (?), *Sicyos angulatus*, *Solanum dulcamara* (flowering), *Teucrium canadense* (?), *Toxicodendron radicans*, *Ulmus rubra* (sapling), *Urtica dioica*, *Viola* cf. *sororia*.

Thanks to Janet Novak for compiling the list of species.

Attendance: 10. Report by leader: Ken Frank.

12 July (Saturday): Basic Fern Identification Workshop

Instructor: Janet Novak. Event cancelled.

26 July (Saturday): Native Fern Propagation Workshop at the Morris Arboretum, PA.

Trip sponsored by the Delaware Fern and Wildflower Society and the Philadelphia Botanical Club.

With a few simple techniques it is easy and fascinating to grow ferns from spores. The instructor described the fern life cycle, spore collection, container sterilization, growing medium, spore sowing, and growing requirements. Participants were supplied with containers holding soil. They had a choice of selecting spores from among *Dryopteris celsa*, *D. clintoniana*, *D. goldiana*, *D. marginalis*, *Athyrium filix-femina*, *Thelypteris noveboracensis* (= *Parathelypteris noveboracensis*), and *Polystichum acrostichoides*.

Attendance: 24. Report by instructor: Tim Draude.

27 July (Sunday): *Rhynchospora knieskernii* Sites in Stafford Forge Wildlife Management Area and Vicinity, Little Egg Harbor Township, Ocean County, NJ.

From our meeting place at Lucille's Restaurant in Warren Grove, we drove south 2.4 miles on Route 539 to a sand road that headed southeast into the Stafford Forge Wildlife

Management Area (SFWMA). After proceeding 1.4 miles, we crossed cedar-lined Westecunk Creek and parked along old Forge Road (aka Pollypod Road), which bisects a pitch pine lowland known to harbor several rare plant species. Deep clay-lined puddles compelled us to hike a mile to reach one of our destinations: a *Rhynchospora knieskernii* propagation experiment plot. En route we botanized the wide clearings and “shoulders” of Forge Road, formerly a narrow, single-lane, jeep trail that in about 1995 was the target of a highly controversial, unauthorized (by the Pinelands Commission) road widening (to > 50 feet) through wetlands by the NJ Fish and Wildlife Service. Radical bulldozing created a zone of disturbance scarred by gullies, mounds of iron stone and muck, and several poorly-drained pits or swales that were favored by weedy species such as *Panicum virgatum*. This violation resulted in the extirpation of at least three occurrences, each consisting of ca. 1,000 tufts, of *Rhynchospora knieskernii* (G2, S2, E, LP), a globally rare beaked sedge currently restricted to the NJ Pine Barrens, and two populations of the globally rare *Gentiana autumnalis* (G3, S3, LP), of 22 and 50 flowers, respectively. Undoubtedly, several other rare species were destroyed as well. From the outset, this flood-prone “roadscape” has attracted (and continues to attract) the drivers of off-road vehicles (ORVs) with oversized tires, whose assaults present a constant threat to the special plants that are struggling to survive here.

Even after a lapse of 19 years, much of this significant habitat has been slow to regenerate. Thus, it was gratifying that our roadside survey produced two spots, each of which contained a few vegetative shoots of *Gentiana autumnalis* and three small patches of *Rhynchospora knieskernii*, of 9, 14, and 28 tufts, respectively. Among other species recorded were *Acer rubrum*, *Amelanchier canadensis*, *Amphicarpum amphicarpon*, *Andropogon glomeratus* var. *glomeratus*, *A. virginicus* var. *virginicus*, *Calamovilfa brevipilis* (LP), *Clethra alnifolia*, *Comptonia peregrina*, *Cyperus dentatus*, *Danthonia sericea*, *Dichanthelium acuminatum*, *Diodia teres*, *Drosera filiformis*, *D. intermedia*, *Eupatorium pilosum*, *Euthamia caroliniana*, *Gaultheria procumbens*, *Gaylussacia baccata*, *G. frondosa*, *Hypericum canadense*, *H. gentianoides*, *H. stragulum* (= *H. hypericoides* subsp. *multicaule*), *Hypoxis hirsuta*, *Ilex glabra*, *Juniperus virginiana*, *Juncus debilis*, *J. scirpoides*, *Kalmia angustifolia*, *Lechea* sp., *Leiophyllum buxifolium*, *Linum* sp., *Lobelia nuttallii*, *Lyonia mariana*, *Lysimachia quadrifolia*, *Magnolia virginiana*, *Morella caroliniensis*, *Nyssa sylvatica*, *Osmundastrum cinnamomeum*, *Panicum rigidulum* subsp. *pubescens* (= *Coleataenia longifolia* subsp. *longifolia*), *P. verrucosum*, *P. virgatum*, *Pinus rigida*, *Polygala nuttallii*, *Pteridium aquilinum*, *Pycnanthemum setosum* (S3), *Pyxidanthra barbulata*, *Quercus marilandica*, *Rhexia virginica*, *Rhus copallinum*, *Rhynchospora capitellata*, *R. torreyana*, *Rubus flagellaris*, *R. hispidus*, *Symphotrichum dumosum*, *Setaria* sp., *Smilax rotundifolia*, *Solidago rugosa*, *Vaccinium corymbosum*, *V. macrocarpon*, *V. pallidum*, *Viola lanceolata*, *V. primulifolia*, and *Xyris torta*.

We next examined a *Rhynchospora knieskernii* propagation plot about 500 feet south of Two-Foot Branch of Westecunk Creek on the west side of old Forge Road. This experiment site required by the Pinelands Commission as mitigation was established in November 2012 by the leader serving as a consulting botanist for Walters Group, Inc. Failure to rescue a population of Knieskern’s Beaked Sedge via transplanting it from the applicant’s Stafford Business Park development envelope near Manahawkin led to further propagation attempts here aimed at enhancing population size. Underlain by a sandy-clay soil, the project site, 18.5 feet long x 14 feet wide, originally contained a meager, linear occurrence of 12 tufts (i.e., seed donors) of the rare sedge within the first ¼ section of the plot near the road. Among the associated species were *Aristida longespica*, *Cyperus dentatus*, *Dichanthelium* sp., *Diodia*

teres, *Drosera filiformis*, *Euthamia caroliniana*, *Hypericum gentianoides*, *Polygala nuttallii*, *Rhynchospora capitellata*, *R. torreyana*, and *Viola lanceolata*. The remainder of the plot was dominated by a dense cover of *Andropogon virginicus* var. *virginicus*, *Panicum rigidulum* subsp. *pubescens*, and *Panicum virgatum*. *Rhynchospora knieskernii* is a sunloving, pioneer sedge intolerant of both shade and competition. Therefore during site preparation, a few pine saplings were sawed down and all associated plants dug up and discarded off site. Filling in shallow depressions and redepositing soil by raking from the foot of the donor site to the ditched terminus of the plot allowed the creation of a very slight drainage slope toward the rear intended to enable seed migration. Three distinct treatment zones were established: 1.) an achene drift zone adjacent to the in situ population; 2.) an achene dissemination zone for ca. 500 off-site seeds; and 3.) a plug transplant zone, recipient of 8 off-site tufts. On our monitoring visit we were pleased to learn that tree trunks and branches that were strategically placed along the roadside boundary of the plot had discouraged access by ORVs. All of us were stunned to see an estimated 3,000 tufts of *Rhynchospora knieskernii*, despite the return of all pre-management competitors. The rare sedge was the dominant species in each of the three propagation zones. It was concluded that a part of the success of the regeneration experiments was due to the presence of a viable seedbank that was reactivated by raking during site preparation.

In the vicinity of our parking area, we explored an east/northeast-bearing road (Melrose) about 100 yards south of the Westcunk Creek crossing. Underlain by Mullica sandy loam, a 160 yard segment of this infrequently travelled road through a pitch pine lowland was dominated by 1,000 tufts of *Rhynchospora knieskernii* near the site's center (where it puddles and has dual lanes). During discovery of this rare sedge on October 31, 1996, the leader recorded 10,000 tufts. On several site visits during the past ten years, dramatic swings in population size (to as few as 340 tufts) were noted. Among the associated species during the present survey were *Amphicarpum amphicarpon*, *Andropogon virginicus* var. *virginicus*, *Aristida longespica*, several clumps of *Calamovilfa brevipilis* (LP), *Cyperus dentatus*, numerous rosettes of *Dichanthelium wrightianum* (S2), *Drosera filiformis*, *D. intermedia*, *D. rotundifolia*, *Epigaea repens*, *Eubotrys racemosa*, *Eupatorium pilosum*, *Gaylussacia dumosa*, a few concealed shoots of *Gentiana autumnalis* (G3, S3, LP), *Hypericum canadense*, *H. gentianoides*, *Kalmia angustifolia*, *Leiophyllum buxifolium*, *Lobelia nuttallii*, *Lyonia mariana*, several tufts of the globally rare *Muhlenbergia torreyana* (G3, S3, LP), *M. uniflora*, *Panicum verrucosum*, *P. virgatum*, and 37 well distributed specimens of *Platanthera cristata* (S3, LP) in bud and in flower, *Pyxidanthera barbulata*, *Rhynchospora capitellata*, *R. torreyana*, *Viola lanceolata*, *V. primulifolia*, and *Xyris torta*.

Before leaving this region, we walked a short road leading north to the gate of Three-Foot Gun Club. On the road edges we noted *Anagallis arvensis*, *Lobelia inflata*, *Lysimachia quadrifolia*, and *Tridens flavus*, atypical species whose presence we attributed to non-native soil and fill brought in for road repair.

Our next stop was Log Swamp Branch of Westcunk Creek ca. 1.5 miles north of GSP west of Route 539. Exploration here of the periphery of an abandoned cranberry bog reservoir and a sand road leading to it resulted in finding the following species: *Apocynum cannabinum*, *Dichanthelium ensifolium*, *Hypericum stragulum*, *Ilex glabra*, *Liatris pilosa* (bud), *Linum* sp., *Lobelia nuttallii*, *Nuphar lutea* subsp. *variegata* (= *N. variegata*), *Nyssa sylvatica*, *Pinus rigida*, *Pteridium aquilinum*, *Pyxidanthera barbulata*, *Sassafras albidum*, *Schoenoplectus subterminalis*, *Scirpus cyperinus*, *Sericocarpus asteroides*, *Smilax glauca*, *S. rotundifolia*, *Solidago odora*, *S. puberula*, *Symphyotrichum dumosum*, *Triadenum*

virginicum, *Viola sagittata*, and all members of the heath family previously listed. In an adjacent turfcut underlain by clay and surrounded by *Chamaecyparis thyoides* and *Acer rubrum*, we added the following species: *Drosera intermedia*, *Dulichium arundinaceum*, *Eleocharis microcarpa*, *E. tuberculosa*, *Eupatorium leucolepis*, *Hypericum canadense*, *Ilex opaca*, *Juncus canadensis*, *Ludwigia alternifolia*, *Lycopodiella alopecuroides*, *L. appressa*, *Nymphaea odorata* subsp. *odorata*, *Pseudolycopodiella caroliniana* (S3), *Rhexia virginica*, *Rhynchospora alba*, *R. capitellata*, *R. chalarocephala*, *R. knieskernii* (500-600 tufts), *Utricularia cornuta*, *U. geminiscapa*, *U. striata*, and *Xyris difformis*. First discovered by the leader in August 1990, the Knieskern's Beaked Sedge occurrence here has remained relatively stable over the years.

A mile to the north on the west side of Route 539 just beyond Governor's Branch of Westecunk Creek, we stopped at a well-known site called Pond 74, an abandoned borrow pit with an uneven bottom of clayey gravel. This excavation behaves much like an intermittent pond and is known to contain *Rhynchospora knieskernii* with dramatic swings in population. When the leader discovered this occurrence in August 1974, there were several thousand tufts. Today, with water at a depth of 12-15 inches, there were a mere two dozen tiny seedlings. Among the associated species were *Bartonia virginica*, *Cladium mariscoides*, *Cyperus dentatus*, *Drosera intermedia*, *Eleocharis microparpa*, *E. olivacea*, *Eriocaulon aquaticum*, *Gratiola aurea*, *Lycopodiella alopecuroides*, *L. appressa*, *Polygala cruciata*, *Pseudolycopodiella caroliniana*, *Rhynchospora alba*, *R. fusca*, and *R. torreyana*.

Our final stop was the Little Plains about a mile west of the fire house in Warren Grove to see one of the most extensive populations of *Corema conradii* (S1, E, LP) extending along the access road to the Federal Aviation Administration's communication towers complex. We searched unsuccessfully for a known population of *Spiranthes tuberosa* (S3, LP), but succeeded in relocating a few plants of *Croton willdenowii* (S2, LP) and a few culms of *Scleria pauciflora* var. *pauciflora* (S1?). A few other significant plants observed here were *Arctostaphylos uva-ursi* (large patches), *Asclepias tuberosa*, *Chondrilla juncea*, *Chrysopsis mariana*, *Euphorbia ipecacuanhae*, *Eurybia spectabilis*, *Hudsonia ericoides*, *Ionactis linariifolius*, and *Scleria triglomorata*.

Thanks to Janet Novak for contributing to the species lists.

Attendance: 10. Report by leader: Ted Gordon

02-03 August (Saturday & Sunday): Intermittent Ponds and associated environments, Cumberland County, Cape May County, NJ. Joint Trip with the Torrey Botanical Society.

The trip began in the Manumuskin Creek watershed approximately 2 mi. north of Cumberland Pond. From Union Rd. (County Rt. 671) the group hiked east and then north (roughly paralleling the Manumuskin Creek) along a sand path. A few active populations of the Allegheny mound ant (*Formica exsectoides*), a rare species in southern New Jersey, were seen in open uplands adjacent to the path. Near one of the mounds, the group was able to observe a large West Jersey Society of Proprietors' survey stone that dates back to the late 1600s when the land was purchased from the Lenape. In a forested swamp along the Canute Branch, a few individuals of *Chionanthus virginicus* (one in fruit), a rare species (S3) in New Jersey, were observed. Two small vernal ponds were then visited. The water level in the ponds ranged from calf-deep to above the knee, and, as a result, the vegetation observed was rather sparse. Good stands of the rare *Utricularia purpurea* (S3, Pinelands listed) were observed in bloom. Other species noted in the ponds included: *Decodon verticillatus*,

Dulichium arundinacium, *Juncus canadensis*, *Panicum longifolium*, *Utricularia geminiscapa*, and *Woodwardia virginica*. The following species were observed while walking through the uplands and lowlands along the sand path: *Acer rubrum*, *Amelanchier canadensis*, *Aristida purpurascens*, *Baptisia tinctoria*, *Carex folliculata*, *C. swanii*, *Cephalanthus occidentalis*, *Chasmanthium laxum*, *Cinna arundinacea*, *Clethra alnifolia*, *Comptonia peregrina*, *Crocanthemum* (*Helianthemum*) *canadense*, *Danthonia spicata*, *Diodia teres*, *Drosera rotundifolia*, *Eupatorium pilosum*, *Eurybia compacta*, *Euthamia caroliniana* (= *E. tenuifolia*), *Gaultheria procumbens*, *Gaylussaccia baccata*, *G. frondosa*, *Hypericum canadense*, *H. gentianoides*, *H. stragulum*, *Juncus tenuis*, *Kalmia angustifolia*, *K. latifolia*, *Lechea mucronata*, *Leersia virginica*, *Lespedeza repens*, *Liatris pilosa* (= *L. graminifolia*), *Liquidambar styraciflua*, *Lobelia nuttallii*, *Lyonia ligustrina*, *L. mariana*, *Magnolia virginiana*, *Melampyrum lineare*, *Monotropa uniflora*, *Panicum verrucosum*, *P. virgatum*, *Pinus rigida*, *Polygala nuttallii*, *Pteridium aquilinum*, *Quercus alba*, *Q. ×brittonii*, *Q. coccinea*, *Q. ilicifolia*, *Q. marilandica*, *Q. montana*, *Q. phellos*, *Q. stellata*, *Rhododendron viscosum*, *Rhynchospora alba*, *R. capitellata*, *Sericocarpus asteroides*, *Smilax rotundifolia*, *Symphotrichum dumosum*, *Tephrosia virginiana*, *Vaccinium corymbosum*, *V. pallidum*, *Woodwardia aerolata*, *Xyris difformis*, and *X. torta*.

The group then traveled to Hunters Mill. Southwest of Hunters Mill (all sites visited were in Cumberland Co.), the group walked along another sand path en route to more intermittent ponds. Along the path near Hunters Mill Rd. a few specimens of *Malus angustifolia*, a rare species (S2), which reaches the northern limit of its range in southern New Jersey, were seen. Other species observed along the path included: *Carya tomentosa*, *Clethra alnifolia*, *Crocanthemum* (*Helianthemum*) *propinquum*, *Danthonia spicata*, *Diodia teres*, *Euthamia caroliniana*, *Gaylussaccia frondosa*, *Hypericum canadense*, *H. gentianoides*, *H. stragulum*, *Juncus tenuis*, *Kalmia angustifolia*, *Liquidambar styraciflua*, *Lobelia nuttallii*, *Lyonia mariana*, *Melampyrum lineare*, *Morella pensylvanica*, *Panicum virgatum*, *Paspalum setaceum*, *Pinus rigida*, *Polygala nuttallii*, *Pteridium aquilinum*, *Quercus alba*, *Q. coccinea*, *Q. falcata*, *Q. ilicifolia*, *Q. marilandica*, *Q. montana*, *Q. stellata*, *Rhexia mariana*, *Rhynchospora capitellata*, *Schizachyrium scoparium*, and *Vaccinium pallidum*. The first two ponds visited were south of a powerline cut. The first pond was much larger than the second; the two ponds were connected by a ditch, undoubtedly not dug in recent times. The smaller second pond does not appear on the U.S.G.S Topographic map as a pond. Both ponds had large specimens of *Vaccinium corymbosum* and *V. fuscatum* (= *V. atrococcum*) scattered in them. The edge of the pond was muddy but devoid of standing water; the centers of the ponds had water levels similar to the previous ponds visited. Rare species observed in the ponds included *Panicum hemitomon* (S2, Pinelands listed), *Scleria reticularis* (Pinelands listed), and *Utricularia purpurea* (S3, Pinelands listed). Other species noted in the ponds included *Chamaedaphne calyculata*, *Drosera intermedia*, *Nymphaea odorata*, *Schoenoplectus subterminalis*, *Scirpus cyperinus*, and *Utricularia striata*. The group then continued walking north along the sand path where it passed an old homestead. Here a large specimen of *Juglans nigra* had a large *Campsis radicans* vine growing on it, the base of the vine being nearly 10" in diameter. An invasive grass native to Asia, *Arthraxon hispidus*, was also observed here. This was the first report of this species from Cumberland County. The path then entered a powerline line cut and here in open, dry sandy areas, good stands of *Croton wildenovii* (= *Crotonopsis elliptica*), a rare species (S2, Pinelands listed), were noted. North of the powerline cut another vernal pond was visited. This pond was dominated by *Vaccinium macrocarpon* and a series of ditches in the pond indicated that this pond

was managed for cranberries at one time. The rare *Lobelia canbyi* (S3, Pinelands listed) was observed, as well as *Bartonia virginica*, *Carex bullata*, *C. striata*, *Cladium mariscoides*, *Dichanthelium scoparium*, *Eleocharis tuberculosa*, *Osmunda regalis*, *Rhynchospora alba*, *R. chalarocephala*, *R. fusca*, *R. macrostachya*, *Sabatia difformis*, *Saccharum giganteum*, *Triadenum virginiana*, *Viola lanceolata*, and *Xyris smalliana*. The group then headed south to visit another pond south of the powerline. This pond was the largest of the four visited in this area, but was not shown as a pond on the U.S.G.S. topographic map, but rather as an isolated forested wetland. The pond was strongly dominated by *Panicum virgatum* and largely devoid of standing water. There were a few mature *Acer rubrum* and *Liquidambar styraciflua* in the pond, which may explain why it was not shown as a pond on the topographic map. Other species noted included: *Cephalanthus occidentalis*, *Cladium mariscoides*, *Dichanthelium spretum*, *Diospyros virginiana*, *Panicum virgatum*, *Rhexia virginica*, *Rhynchospora chalarocephala*, *Saccharum giganteum*, *Woodwardia virginica*, and *Xyris smalliana*. The rare *Lobelia canbyi* (S3, Pinelands listed) was also observed here, as well as a small patch of the rare *Muhlenbergia torreyana* (G3, S3, Pinelands listed).

The group's first stop on **Sunday** was an open, sphagnous bog in a power line right-of-way in Cape May County, south southeast of Head-of-River. Here the group got to see a large population of *Platanthera blephariglottis*, with many specimens in good bloom. The globally rare *Eupatorium resinosum* (G3, S2, state endangered, Pinelands listed) was also observed, most of the material in bud. Regenerating tree species consisted mostly of *Chamaecyparis thyoides* and *Pinus rigida*, with a few individuals of *Acer rubrum*, *Betula populifolia*, *Liquidambar styraciflua*, and *Nyssa sylvatica*. Other species noted in this wetland included *Chasmanthium laxum*, *Clethra alnifolia*, *Decodon verticillatus*, *Dichanthelium mattamuskeetense*, *D. spretum*, *Drosera intermedia*, *Dulichium arundinaceum*, *Eriophorum virginicum*, *Eupatorium pilosum*, *Gaylussacia baccata*, *G. frondosa*, *Juncus canadensis*, *Kalmia angustifolia*, *Lachnanthes caroliniana*, *Lilium superbum*, *Lycopodiella alopecuroides*, *L. appressum*, *Lyonia ligustrina*, *Magnolia virginiana*, *Morella pensylvanica*, *Oclemena nemoralis*, *Osmunda cinnamomea*, *O. regalis*, *Pteridium aquilinum*, *Rhododendron viscosum*, *Rhus copallina*, *Rhynchospora alba*, *Sarracenia purpurea*, *Smilax pseudochina*, *Solidago rugosa*, *S. uliginosa*, *Symphyotrichum novi-belgii*, *Toxicodendron vernix*, *Triadenum virginicum*, *Woodwardia virginica*, *Xyris difformis*, and *X. smalliana*. In the open, sandy, dry roadsides adjacent to the bog, large patches of basal leaves of *Solidago tarda*, a rare species (S3) in New Jersey.

The group then visited a large intermittent pond southeast of Halberton, a short-lived Jewish settlement from the late 1800s. This pond does not appear on the U.S.G.S. topographic map as a pond, but rather as an isolated forested wetland. It is situated near the county line, with most of the pond in Cape May County, but the extreme western portion of the pond, in Cumberland County. The middle portion of the pond had ankle-deep standing water. Large portions of the pond were dominated by the large plume grass, *Saccharum giganteum*. Other areas were dominated by *Woodwardia virginica*. A few individuals of the rare *Lobelia canbyi* were observed. Other species noted included *Carex striata*, *Cladium mariscoides*, *Dichanthelium spretum*, *Diospyros virginiana*, *Eleocharis olivacea*, *E. microcarpa*, *Proserpinaca pectinata*, *Rhexia virginica*, *Rhynchospora chalarocephala*, *R. macrostachya*, *Sabatia difformis*, *Triadenum virginicum*, and *Xyris smalliana*. The best find of the day would not be known for days later when Robert Moyer and Gerry Moore reviewed *Rhynchospora* material they had collected from the pond and determined it to be the exceptionally rare *R. filifolia* (S1, state endangered). A curious insect observation also

required some post trip investigation. A few stems of *Dichanthelium spretum* had unusual egg masses on them (some of the eggs were white; others were brown), as well as some unusual-looking black immature insects. Terry Schmidt remarked that she had recently photographed these same egg masses on stems of *Dichanthelium mattamuskeetense* at the Franklin Parker Preserve in Burlington County (see Figure 1). The insect was later identified as an owlfly (Ascalaphidae) in the genus *Uloides*, probably *U. quadripunctatus*. The black immature individuals observed represented the just-hatched first instars. The white eggs were viable. The brown eggs, situated further down the stem below the fertile eggs, were sterile (repagula) and serve to repel other insects (e.g., ants) that may eat the viable eggs. Owlflies are related to antlions (Myrmeleontoidea), both being in order Neuroptera.

The uplands adjacent to the pond near the road included a planted stand of the hybrid *Pinus rigida* × *P. taeda*. In this plantation, a source of much discussion, were several individuals of a diminutive *Scleria* with smooth white achenes that were tentatively determined to represent exceptionally diminutive material of *S. triglomerata*. Other species noted in the uplands included *Apocynum cannabinum*, *Carex complanata*, *C. pensylvanica*, *C. tosa*, *Clethra alnifolia*, *Comptonia peregrina*, *Cypripedium acaule*, *Dichanthelium sphaerocarpon*, *Gaultheria procumbens*, *Gaylussaccia baccata*, *G. frondosa*, *Hypericum stragulum*, *Ilex glabra*, *I. opaca*, *Juncus tenuis*, *Juniperus virginiana*, *Kalmia angustifolia*, *Lechea racemulosa*, *L. murcronata*, *Lespedeza angustifolia*, *Lyonia mariana*, *Panicum virgatum*, *Pteridium aquilinum*, *Quercus alba*, *Q. coccinea*, *Q. ilicifolia*, *Q. marilandica*, *Sericocarpus asteroides*, *Solidago odora*, *Toxicodendron radicans*, *Vaccinium corymbosum*, and *V. pallidum*.

The group then traveled to Belleplain, where two intermittent ponds were visited in Belleplain State Forest. The first pond was largely devoid of standing water and was dominated by a turf of the rare *Muhlenbergia torreyana* (G3, S3, Pinelands listed). A leafhopper species, *Flexamia whitcombi*, that feeds exclusively on this rare grass was recently newly described from the New Jersey Pine Barrens by Andrew Hicks of the University of Colorado's Museum of Natural History (Zookeys 511: 69–79. 2015). Other rare species observed in the pond included *Dichanthelium wrightianum* (S2), *Lobelia canbyi* (S3, Pinelands listed), and *Scleria reticularis* (Pinelands listed). Other species noted in this pond included *Drosera intermedia*, *Eleocharis microcarpa*, *E. tricostata*, *Hypericum denticulatum*, *Rhynchospora chalarocephala*, *Vaccinium corymbosum*, and *Xyris difformis*. The second pond is west of the first pond and does not appear on the U.S.G.S. topographic maps as a pond. The water level in this pond ranged from ankle-deep to calf deep. Species noted in this pond included *Carex striata*, *Dichanthelium spretum*, *Eleocharis tricostata*, *Hypericum denticulatum*, *Panicum longifolium*, *P. verrucosum*, *Rhexia virginica*, *Rhynchospora chalarocephala*, *Rhynchospora macrostachya*, *Utricularia subulata*, and *Xyris difformis*.

The group's last stop was an intermittent pond west of Head-of-River. The water level in this pond ranged from ankle deep to knee deep towards the center of the pond. A good-sized snapping turtle was observed in the pond. The turtle did not yield his ground and the group was forced to walk around it. Rare species noted in this pond included *Rhynchospora inundata* (S2, Pinelands listed), *Sclerolepis uniflora* (S2, Pinelands listed), and *Utricularia purpurea* (S3, Pinelands listed). A few individuals of *Rhexia* material that is somewhat intermediate between *R. aristosa* and *R. virginica* were observed (see Snyder in *Bartonia* 59: 63 fn 3. 1996). Other species noted included *Carex striata*, *Cladium mariscoides*, *Dichanthelium spretum*, *Eriocaulon compressum*, *Saccharum giganteum*, and *Xyris smalliana*.

Attendance: 18. Report by leaders: Uli Lorimer and Gerry Moore.



Figure 1. Stem of *Dichanthelium mattamuskeetense* with the eggs of *Ulodes*, probably *U. quadripunctatus*. (Franklin Parker Preserve, Burlington Co., New Jersey.) The white eggs on the right are viable. The brown eggs on the left (further down the stem) are sterile (repagula) and serve to repel other insects that may eat the viable eggs. Photo by Terry Schmidt.

10 August: Spring Mountain and the Perkiomen Trail, Montgomery County, PA. Joint trip with the Delaware Valley Fern and Wildflower Society.

Spring Mountain is a large, steep hill of diabase, a volcanic rock that makes for a soil that is nutrient-rich, but often thin and stony. The site is notable for some plants that typically grow in cooler areas. Despite the lateness of the season, we saw a fair number of plants in bloom. In small meadows adjacent to the Perkiomen Trail, we saw flowers on *Sabatia angularis* (rose-pink), *Cuphea viscosissima* (clammy cuphea), *Asclepias incarnata* (swamp milkweed), and *Eutrochium fistulosum* (hollow-stemmed Joe-Pye weed). Plants in bloom within or at the edges of the woods included *Eutrochium purpureum* (purple-node Joe-Pye weed), *Helianthus decapetalus* (thin-leaved sunflower), and *Heliopsis helianthoides* (false sunflower or ox-eye). The false sunflowers could be picked out at a glance by their golden-yellow flowers, as opposed to the straight yellow of the true sunflowers. We also got buds or flowers on some woodland asters (*Eurybia schreberi*, *E. divaricata*, and *Symphotrichum cordifolium*). Along the Perkiomen Creek we saw *Lysimachia ciliata* (fringed loosestrife) and *Saururus cernuus* (lizard-tail).

Spring Mountain itself is home to some plants that typically grow in cooler areas. Most notable among these is *Acer spicatum* (mountain maple), which we saw near the base of Spring Mountain. During pre-trip scouting, the leader was surprised to find more of this

maple at the base than higher on the mountain. It may prefer the base because the creek (which is quite large) moderates daytime heat in the summer. Near the mountain maple we found *Gymnocarpium dryopteris* (oak fern), which is typically northern as well. Also in the area were *Trillium cernuum* (nodding trillium) and three ferns: *Asplenium rhizophyllum* (walking fern), *Cystopteris tenuis* (fragile fern), and *Huperzia lucidula* (shinning clubmoss).

We recorded a total of 176 species:

Acer platanoides, *A. rubrum*, *A. saccharum*, *A. spicatum*, *Achillea millefolium*, *Actaea pachypoda*, *A. racemosa*, *Adiantum pedatum*, *Agrimonia parviflora*, *A. pubescens*, *Ailanthus altissima*, *Ambrosia artemisiifolia*, *Amphicarpaea bracteata*, *Anemone americana* (= *Hepatica nobilis* var. *obtusata*), *Apocynum cannabinum*, *Aralia nudicaulis*, *A. racemosa*, *Arisaema triphyllum*, *Artemisia vulgaris*, *Arthraxon hispidus*, *Asarum canadensis*, *Asclepias incarnata*, *A. syriaca*, *Asplenium rhizophyllum*, *Berberis thunbergii*, *Betula lenta*, *Bidens* sp. (*bipinnata*?), *Botrychium virginianum* (= *Botrypus virginianus*), *Brachyelytrum erectum*, *Buddleja* sp., *Carpinus caroliniana*, *Carya cordiformis*, *C. ovata*, *Castanea dentata*, *Catalpa* sp., *Celtis* sp., *Centaureum pulchellum*, *Cercis canadensis*, *Chamaecrista fasciculata*, *Cichorium intybus*, *Circaea lutetiana*, *Collinsonia canadensis*, *Commelina communis*, *Cornus florida*, *Corylus cornuta*, *Cryptotaenia canadensis*, *Cuphea viscosissima*, *Cuscuta* sp., *Cystopteris tenuis*, *Daucus carota*, *Dennstaedtia punctilobula*, *Desmodium glutinosum*, *D. nudiflorum*, *D. paniculatum*, *Dianthus armeria*, *Dicentra canadensis*, *Dioscorea villosa*, *Dirca palustris*, *Dryopteris marginalis*, *Elaeagnus umbellata*, *Elymus hystrix*, *Equisetum* sp. (probably *E. arvense*), *Erechtites hieraciifolia*, *Erigeron annuus*, *Euphorbia nutans*, *Eurybia divaricata*, *E. macrophylla*, *E. schreberi*, *Euthamia graminifolia*, *Eutrochium fistulosum*, *E. purpureum*, *Fagus grandifolia*, *Fraxinus nigra*, *F. pensylvanica*, *Gymnocarpium dryopteris*, *Hamamelis virginiana*, *Helianthus decapetalus*, *Heliopsis helianthoides*, *Hemerocallis* sp., *Hesperis matronalis*, *Humulus japonicus*, *Huperzia lucidula*, *Hydrophyllum virginianum* (probably), *Hypericum punctatum*, *Impatiens capensis*, *I. pallida*, *Juglans nigra*, *Juniperus virginiana*, *Kalmia latifolia*, *Lactuca serriola*, *Ligustrum* sp., *Lindera benzoin*, *Liriodendron tulipifera*, *Lobelia inflata*, *Lonicera japonica*, *L. morrowii*, *Lysimachia ciliata*, *Lythrum salicaria*, *Magnolia tripetala*, *Maianthemum racemosum* (= *Smilacina racemosa*), *Matteuccia struthiopteris*, *Menispermum canadense*, *Microstegium vimineum*, *Mitchella repens*, *Mitella diphylla*, *Monotropa uniflora*, *Nabalus* sp. (= *Prenanthes* sp.), *Nyssa sylvatica*, *Onoclea sensibilis*, *Ostrya virginiana*, *Oxalis* sp. (maybe *O. stricta*), *Pachysandra terminalis*, *Parthenocissus quinquefolia*, *Penstemon digitalis*, *Persecaria perfoliata* (= *Polygonum perfoliatum*), *P. virginiana* (= *Polygonum virginianum*), *Phlox paniculata*, *Phryma leptostachya*, *Phytolacca americana*, *Picea abies*, *Pilea pumila*, *Pinus strobus*, *P. sylvestris*, *Platanus occidentalis*, *Polygonatum pubescens*, *P. virginianum*, *Polypodium virginianum*, *Polystichum acrostichoides*, *Prunella vulgaris*, *Prunus serotina*, *Pycnanthemum tenuifolium*, *Quercus alba*, *Q. montana*, *Q. rubra*, *Q. velutina*, *Rhododendron periclymenoides*, *Robinia pseudoacacia*, *Rubus odoratus*, *R. phoenicolasius*, *Rudbeckia laciniata*, *Sabatia angularis*, *Sanguinaria canadensis*, *Sanicula* sp., *Saponaria officinalis*, *Sassafras albidum*, *Saururus cernuus*, *Securigera varia* (= *Coronilla varia*), *Sicyos angulatus*, *Silene stellata*, *Smilax herbacea*, *Solanum nigrum*, *Solidago caesia*, *S. gigantea*, *Staphylea trifolia*, *Symphyotrichum cordifolium*, *Teucrium canadense*, *Thaspium barbinode*, *Tilia americana*, *Toxicodendron radicans*, *Tridens flavus*, *Trillium cernuum*, *Typha* sp., *Ulmus rubra*, *Uvularia perfoliata*, *U. sessilifolia*, *Verbena urticifolia*, *Vernonia noveboracensis*, *Veronicastrum virginicum*, *Viburnum acerifolium*, *V. prunifolium*, *Vicia cracca*, *Vinca minor*, *Viola labradorica*, *Viola* sp. (most likely *V. sororia*), *Xanthium* sp., and *Zizia aurea*.

Attendance: 18. Report by leader: Janet Novak.

06 September (Saturday): Cedar Swamp, Flood Gates, Repaupo Station, Gloucester County, NJ. Joint Trip with the Torrey Botanical Society.

This trip was a follow-up to the one of 29 June 2013 (*Bartonia* 67: 110–111. 2015). The goal once again was to explore the stands of Atlantic white cedar that continue to occur in the larger swamp still known as Cedar Swamp (much of it no longer comprised of white cedar). However, this effort was again stymied by high water levels, and the group was forced to visit other areas. Many of the areas visited this time were also visited in 2013, and we saw many of the same plants. This report focuses on noteworthy species observed during the 2014 trip that were not observed in 2013.

Forested freshwater tidal swamps along Little Timber Creek (south side) were visited. Tree species here included *Acer rubrum*, *Ilex opaca*, *Liriodendron tulipifera*, and *Nyssa sylvatica*. A few individuals of *Physocarpus opulifolius* were noted; this species in southern New Jersey is largely restricted to woodlands near the Delaware River. In open areas of the forest, species more typical of open tidal marshes were present, including *Pluchea odorata*, *Samolus floribundus*, *Zizania aquatica*, and the rare *Bidens bidentoides* (G3G4, S2). On the north side of Little Timber Creek are open tidal marshes, and it was pointed out that stumps of white cedar are frequent here, evidence that the area was once nontidal and dominated by white cedar.

A nearby chain of small abandoned gravel pits was also explored. Species noted here included *Carex crinita* var. *brevicrinis*, *Eleocharis obtusa*, *E. olivacea*, *E. tenuis*, *E. tuberculosa*, *Gratiola aurea*, *Lindernia dubia*, *Ludwigia alterniflora*, *L. palustris*, *Panicum dichotomiflorum*, *P. scoparium*, *P. verrucosum*, *P. virgatum*, *Phragmites australis*, *Polygala nuttallii*, *Rhexia mariana*, *R. virginica*, and *Rhynchospora capitellata*. In one pond with standing water, the rare *Najas gracillima* (S2) was noted. In many of these gravel pits, as well as many of the artificial ponds off Flood Gate Rd., large stands (some with thousands of flowering stems) of the rare *Utricularia gibba* (S3) were noted. This species is readily distinguished from other species of yellow-flowered *Utricularia* [e.g., *U. cornuta*, *U. geminiscapa*, *U. juncea*, *U. striata*, *U. subulata*, *U. vulgaris* (= *U. macrorrhiza*)] by the entangled floating mats formed by the vegetative material. It is distinguished from the closely related *U. biflora* by the flowers' small spurs (ca. 3 mm) shorter than the lip. In some of the ponds, the non-native *Ludwigia uruguayensis* was present, its large yellow flowers (petals > 15 mm.) most striking and much larger than any of our native *Ludwigia* species. Attendance: 12. Report by leaders: Uli Lorimer and Gerry Moore.

13 September (Saturday): Aquatic Plants for Beginners. Abbott Marshlands (aka Hamilton–Trenton–Bordentown Marsh), Mercer County, NJ. Joint trip with the Torrey Botanical Society and the Delaware Valley Fern and Wildflower Society.

The trip began at Spring Lake in Roebling Park, Hamilton. We first examined the differences among: leaves of *Iris pseudacorus*, *Sparganium eurycarpum*, and *Typha latifolia* (vs. *T. angustifolia*). We also compared leaves of *Nuphar advena*, *Peltandra virginica*, *Pontederia cordata*, and *Sagittaria latifolia*. Flowering plants of *Persicaria amphibia* (= *Polygonum amphibium*), *P. hydropiperoides* (= *Polygonum hydropiperoides*), *P. punctata* (= *Polygonum punctatum*) [vs. *P. hydropiper*], *P. sagittata* (= *Polygonum sagittatum*), and *P. arifolia* (= *Polygonum arifolium*) were also compared. Other plants observed included *Apios americana*, *Asclepias incarnata*, *Bidens discoidea*, *Boehmeria cylindrica*, *Cicuta bulbifera* (with many bulblets), *Cyperus bipartitus*, *Decodon verticillatus*, *Heteranthera multiflora**, *Hibiscus moscheutos*, *Impatiens capensis*, *Ludwigia peploides*, *Leersia oryzoides*, *Lythrum*

salicaria, *Mikania scandens*, *Rumex altissimus*, and *Zizania aquatica*. Submergent species were *Ceratophyllum demersum* and *Utricularia* sp. Floating plants in the *Lemnoideae* included *Lemna minor*, *Spirodela polyrhiza*, *Wolffia columbiana*, and *Wolffiella gladiata**. On the island were a few late flowers of *Lobelia cardinalis*, as well as *Chelone glabra*, and *Eutrochium maculatum*.

Pteridophytes at the edge of Spring Lake and along the trail were *Athyrium filix-femina*, *Botrychium dissectum* (= *Sceptridium dissectum*), *Equisetum arvense*, *Onoclea sensibilis*, *Osmundastrum cinnamomeum* (= *Osmunda cinnamomea*), and *Thelypteris palustris* var. *pubescens*). Shrubs included: *Alnus serrulata*, *Celphalanthus occidentalis*, *Ilex verticillata*, *Sambucus canadensis*, and *Viburnum dentatum*.

At the edge of the Delaware River near the Trenton boat launch on Lamberton Road were *Amorpha fruticosa*, *Bidens bidentoides**, *Cyperus flavescens*, *Eleocharis* sp., *Helenium autumnale*, *Justicia americana*, *Sagittaria subulata**, and *Vernonia noveboracensis*.

The last stop was along Lamberton Road behind PSEG. In wet vehicle ruts were *Ammannia coccinea** (discovered in 2012 by M. & C. Leck, and, according to David Snyder, last reported in NJ ~100 years ago), *Cyperus difformis*, *Juncus acuminatus*, *Heteranthera multiflora*, and *H. reniformis*.

Chris Hoess kept a trip list of species. (*= rare for NJ)

Attendance: 8. **Report by leader Mary Leck**

04 October (Saturday): Saddler's Woods, Haddon Township, Camden County, New Jersey. Joint trip with the Delaware Valley Fern and Wildflower Society.

Saddler's Woods is a 25-acre urban woodland containing old-growth trees, secondary-growth areas, and tributaries to the Newton Creek. The site is managed for invasive species and storm water erosion, both of which are significant challenges due to its urbanized surroundings. However, many common and interesting native species abound, and the old-growth trees are spectacular to behold. Artifacts found on the site reflect a rich and varied history including Lenni Lenape habitation, a 19th century settlement of African Americans, and 20th century short-dumping. Saddlertown, the adjacent African American enclave, was founded by Joshua Saddler, a fugitive slave from Maryland whose freedom was acquired by a local Quaker farmer. Saddler included in his will a prohibition against cutting timber on his lot, a conservation legacy which aided in the permanent protection of Saddler's Woods and for which the woods is named in memoriam. (See also www.saddlerswoods.org).

We began by walking east along MacArthur Boulevard from the lawn welcome area to the North-South trail. In this roadside habitat, we observed black walnut (*Juglans nigra*), American beech (*Fagus grandifolia*), tuliptree (*Liriodendron tulipifera*), London plane tree (*Platanus × acerifolia*), pignut hickory (*Carya glabra*), and black gum (*Nyssa sylvatica*) in the tree canopy. Smaller trees, understory shrubs and vines included red osier dogwood (*Cornus sericea*), big-tooth aspen (*Populus grandidentata*), arrowwood (*Viburnum dentatum*), grey birch (*Betula populifolia*), white ash (*Fraxinus americana*), sassafras (*Sassafras albidum*), an alien honeysuckle shrub (*Lonicera* sp.), black cherry (*Prunus serotina*), American holly (*Ilex opaca*), European sweet cherry (*Prunus avium*), Virginia creeper (*Parthenocissus quinquefolia*), poison ivy (*Toxicodendron radicans*), *Clematis* sp., and an alien yew (*Taxus* sp.). Christmas fern (*Polystichum acrostichoides*), marginal wood fern (*Dryopteris marginalis*), blue-stemmed goldenrod (*Solidago caesia*), self-heal (*Prunella vulgaris*), gall-of-the-earth (*Nabalus trifoliatus* = *Prenanthes trifoliata*), rough-stemmed

goldenrod (*Solidago rugosa*), broadleaf helleborine (*Epipactus helleborine*), false Solomon's seal (*Maianthemum racemosum*), tick trefoil (*Desmodium paniculatum*), and beech drops (*Epifagus virginiana*) filled out the herbaceous layer. It should be noted that while most of the native species on site are naturally occurring, native plantings have been installed in restoration zones where invasive species have been removed.

We turned right onto the North-South trail and progressed through the more disturbed edge, where we noted blackhaw viburnum (*Viburnum prunifolium*), white panicle aster (*Symphyotrichum lanceolatum*), hackberry (*Celtis occidentalis*), chokeberry (*Aronia sp.*), late-flowering thoroughwort (*Eupatorium serotinum*), jewelweed (*Impatiens capensis*), and white vervain (*Verbena urticifolia*) alongside the aliens mugwort (*Artemisia vulgaris*), dock (*Rumex sp.*), and non-native lady's thumb (*Persicaria maculosa* = *Polygonum persicaria*). As we proceeded, in drier sections large old-growth black, red and white oaks (*Quercus velutina*, *Q. rubra*, and *Q. alba*) towered over flowering dogwood (*Cornus florida*), Japanese angelica tree (*Aralia elata*), garlic mustard (*Alliaria petiolata*), white mulberry (*Morus alba*), English ivy (*Hedera helix*), burning bush (*Euonymus alatus*), black locust (*Robinia pseudoacacia*), Japanese holly (*Ilex crenata*) and American plum (*Prunus americana*), an interesting find. Closer to several small tributaries, we noted hearts-a-bursting (*Euonymus americanus*) with fruit, Virginia knotweed (*Persicaria virginiana* = *Polygonum virginianum*), glaucous-leaved greenbrier (*Smilax glauca*), mockernut hickory (*Carya tomentosa*), hay-scented fern (*Dennstaedtia punctilobula*), pinxter azalea (*Rhododendron periclymenoides*), round-leaved greenbrier (*Smilax rotundifolia*), highbush blueberry (*Vaccinium corymbosum*), ironwood (*Carpinus caroliniana*), green ash (*Fraxinus pennsylvanica*), and the rare Virginia snakeroot (*Endodeca serpentaria* = *Aristolochia serpentaria*). Past the severely eroded "grand canyon" tributary of Saddler's Run, we added willow oak (*Quercus phellos*), clearweed (*Pilea pumila*), silver maple (*Acer saccharinum*), black snakeroot (*Sanicula canadensis*), multiflora rose (*Rosa multiflora*), Japanese stiltgrass (*Microstegium vimineum*), sweet pepperbush (*Clethra alnifolia*), blackberry (*Rubus sp.*), mimosa (*Albizzia julibrissin*), Japanese knotweed (*Reynoutria japonica* = *Polygonum cuspidatum*), and basswood (*Tilia americana*). Large swamp white oaks (*Quercus bicolor*) and white oaks mixed with box elder (*Acer negundo*), stands of witch hazel (*Hamamelis virginiana*), and a large chestnut oak (*Quercus montana*). In the herbaceous layer we added false nettle (*Boehmeria cylindrica*).

We followed the North-South trail back to the fire hydrant and turned left to follow the trail around the edge of the Van Sciver Elementary School's athletic field. Red cedar (*Juniperus virginiana*), black cherry, and possibly common buckthorn (*Rhamnus cathartica*) lined the short section of trail heading east, with Canada honewort (*Cryptotaenia canadensis*) in the herb layer. Majestic old white oaks attracted attention as the trail looped back north. Winged sumac (*Rhus copallina*), *Rubus sp.*, grape (*Vitis sp.*), and callery pear (*Pyrus calleryana*) were noted in the shrub layer adjacent to the athletic field. Before returning west to reconnect to the North-South trail, we explored the edge of a rain garden installed at the adjacent Van Sciver School in an attempt to mitigate the stormwater runoff entering the woods. Along the edge we identified purpletop (*Tridens flavus*), frost aster (*Symphyotrichum pilosum*), smooth white aster (*S. racemosum*), Jerusalem artichoke (*Helianthus tuberosus*), and rose-of-Sharon (*Hibiscus syriacus*). While noting two old-growth willow oaks tucked along the residential property line north of the rain garden edge, we observed cinnamon fern (*Osmundastrum cinnamomeum* = *Osmunda cinnamomea*), spicebush (*Lindera benzoin*), linden viburnum (*Viburnum dilatatum*), violets (*Viola spp.*), periwinkle (*Vinca minor*), trumpet creeper

(*Campsis radicans*), marginal wood fern (*Dryopteris marginalis*), summer grape (*Vitis aestivalis*), porcelainberry (*Ampelopsis brevipedunculata*), white avens (*Geum canadense*), Oriental bittersweet (*Celastrus orbiculatus*), winterberry holly (*Ilex verticillata*), tall lettuce (*Lactuca canadensis*), staghorn sumac (*Rhus typhina*), honey locust (*Gleditsia triacanthos*), dogbane (*Apocynum cannibinum*), buttonbush (*Cephalanthus occidentalis*), beggarticks (*Bidens* spp.), common mullein (*Verbascum thapsus*), late goldenrod (*Solidago altissima*), and Chinese wisteria (*Wisteria sinensis*). An eastern box turtle (*Terrapene carolina carolina*) also crossed our path and made the list.

Attendance: 5. Report by leader: Robyn A. Jeney.

18 October (Saturday): Woody Plant Propagation Workshop and Greenland Nursery Tour, Philadelphia, PA

Greenland Nursery is operated by Philadelphia Parks & Recreation with a focus on propagation of local provenance native plants for use in municipal restoration projects. This west Fairmount Park facility dates from the late 1800s and is being restored after years of neglect. The group gathered for a tour of the facility and an introductory session on propagation of native plants. Topics included assessing seed maturity in the field, necessary tools and materials for collection, cleaning, and storage, and the basics of germination. A short tour of the different facilities used for propagation and growth of plants destined for Philadelphia's natural areas included some background on the work being done by the department. The workshop concluded with each participant taking a sample of seeds from Greenland's stock and preparing it for stratification and germination at home.

Report by leader: Maximilian Blaustein, Nursery Manager.

07 December (Sunday): Gwynedd Preserve, Ambler, Montgomery County, Pennsylvania

A small group of PBC members botanized the Gwynedd Preserve, a 279-acre property of the Natural Lands Trust. The preserve is former farmland that the NLT has been restoring to grassland and forest. We also botanized a small area just outside the west corner of the Gwynedd Preserve. This area, within Gwynedd Township Open Space, consisted of wet meadow and woods near Haines Run.

In grasslands, species we identified were *Achillea millefolium*, *Agrimonia* sp., *Andropogon virginicus*, *Apocynum* sp., *Arthraxon hispidus*, *Asclepias syriaca*, *Celastrus orbiculatus*, *Chamaecrista fasciculata*, *Cirsium arvense*, *Daucus carota*, *Dianthus armeria*, *Dichanthelium* sp., *Euthamia graminifolia*, *Heliopsis helianthoides* (probably, though possibly a *Helianthus*), *Hypericum* sp., *Juniperus virginiana*, *Lespedeza capitata*, *Linaria vulgaris*, *Lonicera japonica*, *Monarda* sp., *Oenothera biennis*, *Panicum virgatum*, *Penstemon* sp. (probably *P. digitalis*), *Pycnanthemum tenuifolium*, *Pyrus calleryana*, *Quercus acutissima*, *Rudbeckia* sp., *Rumex crispus*, *Schizachyrium scoparium*, *Solanum carolinense*, *Solidago* sp. (probably *S. canadensis*), *Sorghastrum nutans*, *Taraxacum officinale*, *Verbascum blattaria*, *V. thapsus*, *Verbesina alternifolia*, *Vernonia noveboracensis*, *Viburnum prunifolium*, and, surprisingly, an orchid that appeared to be a *Platanthera*, though in unexpected habitat (mesic meadow with dense grasses). There were also some relatively showy woody plants in a neat line along the edges of trails, so we presume they were planted: *Hamamelis virginica* (in bloom), *Ilex verticillata*, *Viburnum dentatum*, *Betula nigra*, *Quercus phellos*, and *Q. palustris*.

In and near a small marsh in the Gwynedd Preserve we saw *Alnus* sp., *Bidens* sp., (maybe *B. polylepis*), *Cephalanthus occidentalis*, *Lythrum salicaria*, *Platanus occidentalis*, *Scirpus cyperinus*, *Symphotrichum* spp., *Typha* sp., and *Verbena hastata*.

The area along Haines Run in the township open space proved particularly interesting, with a good-sized stand of *Senna hebecarpa* and a number of very tall plants of *Amorpha fruticosa*. Other plants we noted near Haines Run were *Acer rubrum*, *Alliaria petiolata*, *Catalpa* sp., *Clematis* sp., *Epilobium* sp., *Euonymus alatus*, *Eutrochium* sp., *Geum* sp., *Juncus tenuis*, *Ligustrum* sp., *Lobelia* sp. (most likely *L. cardinalis*), *Ludwigia alternifolia*, *Lycopus* sp., *Microstegium vimineum*, *Mimulus ringens*, *Onoclea sensibilis*, *Persicaria arifolia* (= *Polygonum arifolium*), *Rosa multiflora*, and *Ulmus americanus*.

Attendance 7. **Report by leader: Janet Novak.**

Correction to field trip report for 06 July 2013: Dutchtown, Atsion, Old Forge Pond above Pleasant Mills (*Bartonia* 67: 113. 2015).

The location for Miller cranberry bogs should be corrected from, “just south of Dutchtown west of Route 206,” to, “just south of Dutchtown east of Route 206.”

Program of Meetings
September 2014–June 2015

| Date | Subject | Speaker |
|--------|--|----------------------|
| 2014 | | |
| 25 Sep | Members' Reports on Summer Botanizing | |
| 23 Oct | PA Lake Plants—What, Where, Why?..... | Ann Rhoads |
| 20 Nov | The Influence of Disturbance on the Demography of the Rare Pine Barren Gentian (<i>Gentiana autumnalis</i>) in New Jersey..... | Ryan Rebozo |
| 18 Dec | Greenland Nursery: Propagating Natives for Philadelphia Parks | Maximilian Blaustein |
| 2015 | | |
| 22 Jan | Some Natural History of Philadelphia..... | David Hewitt |
| 26 Feb | The Laboulbeniales, an Enigmatic Group of Insect- Parasitizing Fungi..... | Danny Haelewaters |
| 26 Mar | Buzz around the Blossoms: the Beauty, Importance and Wonder of New Jersey's Native Bees | Dan Cariveau |
| 23 Apr | The Schuyler Lecture in North American Botany and Botanists: European Plant Collections of John Stuart Mill at the Academy of Natural Sciences..... | Ernie Schuyler |
| 28 May | Weeds Under Your Car: Island Biogeography of Parking Lots | Lena Struwe |
| 1 Oct | Members' Reports on Summer Botanizing | |
| 22 Oct | Earth, Wind, and Fire: Resource Allocation Strategies of <i>Rhynchospora knieskernii</i> J. Carey (Cyperaceae) in a Disturbance-Dependent Ecosystem..... | Marilyn Sobel |
| 19 Nov | Witmer Stone: The Fascination of Nature | Scott McConnell |
| 17 Dec | How to Build Two Houses From One: The Evolution of Separate Sexes in Angiosperms | Cindy Skema |

BARTONIA

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